



# Influenza Seasonal Summary, Departments of the Navy and Defense, 2015-2016

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14. ABSTRACT This report summarizes influenza activity among Department of Navy (DON) and Department of Defense (DOD) beneficiaries during the 2015-2016 influenza season. Using multiple electronic data sources (namely laboratory results, pharmacy transactions, immunization records, encounter and admission records, medical event reports) the impact of influenza on the DON beneficiary population was assessed and summarized. Each data source enabled the evaluation from a different clinical perspective, and further allows for the determination of the relationship between the sources.					
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## Executive Summary

The EpiData Center (EDC) at the Navy and Marine Corps Public Health Center (NMCPHC) monitors influenza activity on a weekly basis throughout the influenza season, using Health Level 7 (HL7) formatted Composite Health Care System (CHCS) (laboratory, pharmacy, and radiology data), inpatient admission records, ambulatory medical encounter records, and vaccination records. This report summarizes influenza activity among Department of the Navy (DON) and Department of Defense (DOD) beneficiaries during the 2015-2016 season.

Influenza activity among DON beneficiaries during the 2015-2016 season exhibited a later peak and extended later into the season, and overall was milder when compared to baselines. DON trends mirrored those for the general civilian population of the United States (US); DON influenza activity increased during Week 5 and peaked at Week 9, while activity in the US peaked in mid-March 2016. Influenza activity in the US was milder when compared to the 2014-2015 season. DON influenza trends were similar to DOD trends, with a laboratory peak during Week 10 and an antiviral prescriptions peak during Week 9. Laboratory-positive case rates for active duty (AD) Army and Air Force personnel exceeded DON AD personnel rates.

## Summary of Results

Total DON influenza cases identified from laboratory, pharmacy, and clinical encounters (inpatient and ambulatory records) data peaked at Week 9 with 648 cases. The percentage of cases identified in two or more data sources was 40.8%, with only 15.8% of cases identified in all three data sources. The highest proportion of cases was identified among pharmacy records.

The overall specimen positivity rate among DON laboratory cases was 14.5%. Influenza A was the dominant influenza type during the season at 62.9% of positive specimens. The volume of both laboratory-positive cases and antiviral (AV) prescriptions was below baseline from Week 40 through Week 7; cases peaked at Week 9 and remained above baseline through the remainder of the season (Week 17). Oseltamivir was the most frequently prescribed antiviral.

Influenza-like illness (ILI) cases among DON beneficiaries followed mostly similar trends; a peak occurred at Week 9 and the percentage of ILI encounters exceeding baseline only occurred for a few weeks after the peak. The rates of laboratory cases and AV prescriptions were highest among children 0-4 years of age. Ninety-two inpatient laboratory-positive cases were identified; 57 of these met the case definition for reporting in the Disease Reporting System-internet (DRSi) but only 20 had a medical event report (MER).

## Active Duty and Recruits

Influenza activity among AD and recruit Sailors and Marines were similar to overall DON beneficiary trends; however, both laboratory cases and AV prescriptions peaked later at Week 11 for Sailors and Week 10 for Marines. The majority of AD cases were among Sailors in both laboratory and pharmacy data. The vaccination rate for AD and Reserve Sailors and Marines was 96.4% at Week 17; the DOD goal of 90% vaccination was achieved during Week 51 (20-26 December 2015) for the Navy and Week 1 (3-9 January 2016) for the Marine Corps. The majority (76.8%) of influenza cases among AD and recruit Sailors and Marines had a record of



vaccination at least 14 days prior to infection (which is considered immune).

### Geographic Distribution

Influenza activity among DON beneficiaries was greatest at Naval Medical Center (NMC) San Diego; other locations with high volumes of laboratory cases and AV prescriptions included Naval Hospital (NH) Jacksonville, Camp Pendleton, and Camp Lejeune. Navy military treatment facilities (MTFs) located in southern California experienced peak burden of influenza activity earlier during the season than other MTFs.

### Conclusion

Robust influenza surveillance in the DON was achieved through the use of multiple data sources. Multiple data sources increased the validity of the findings and provided a comprehensive overview of influenza trends among DON beneficiaries. This information may assist BUMED in determining the overall burden of influenza in the DON community and its impact on mission readiness, and may assist in policy planning and preparation for the upcoming seasons.



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## Objective

This report summarizes influenza activity among Department of the Navy (DON) and Department of Defense (DOD) beneficiaries during the 2015-2016 influenza season.

## Background

Influenza is a contagious, viral respiratory illness that can lead to mild or moderate symptoms that include, but are not limited to, fever, sore throat, malaise, and headaches. In severe cases, influenza may result in pneumonia, respiratory failure, and death. A Centers for Disease Control and Prevention (CDC) study of influenza seasons from 1976 to 2006 estimated seasonal influenza-associated deaths at a low of 3,000 to a high of 49,000 in the United States (US).<sup>1</sup> The World Health Organization (WHO) estimates 250,000 to 500,000 influenza-associated deaths worldwide each season.<sup>2</sup> The influenza virus is categorized into influenza types, of which Type A and Type B routinely spread among humans and cause seasonal infections each year. An emergence of new influenza strains can result in pandemics, such as the 2009 H1N1 influenza pandemic, or sporadic outbreaks, such as the 2013 avian influenza A (H7N9) virus outbreak in China.<sup>3,4</sup> The CDC monitors US influenza activity on a weekly basis from October through mid-May. Though seasons vary, a typical influenza season is characterized by a lower incidence of illness in October and November; peak incidence most frequently occurs in February, followed by December, January, and March.<sup>5</sup>

Seasonal influenza vaccines are the most effective methods for reducing the likelihood of an influenza viral infection and/or spreading the infection to others. The vaccines are typically recommended for anyone over six months of age and are particularly important for those at high risk for developing complications. The vaccines are formulated based on the viruses predicted to be most prevalent in the upcoming season. Influenza vaccines are available as a high-dose vaccine, intradermal vaccine, regular flu shot, or nasal spray flu vaccine. During the 2015-2016 season, the nasal spray vaccine was recommended for children two to eight years of age. Antibodies to the viruses develop within 14 days, on average, after vaccine administration.<sup>6</sup>

Influenza-specific antiviral (AV) medications may reduce influenza symptoms, shorten the period of illness, or prevent serious complications such as pneumonia.<sup>7</sup> Influenza-specific AVs are most effective if administered within two days of symptom onset and for a duration of five days. AVs may also be administered for post-exposure chemoprophylaxis. Antiviral treatment and chemoprophylaxis are an important element of outbreak control among high-risk populations in institutional settings, such as child care facilities, nursing homes, correctional facilities, and military barracks.<sup>8</sup> Risk of complications, type and duration of contact, local public health recommendations, and clinical judgement must all be considered prior to the implementation of AV treatment for infected individuals. Indiscriminate use of AVs may elevate resistance to these medications or reduce seasonal availability.<sup>8</sup>

The CDC released one update via the CDC Health Advisory Network (HAN) during the 2015-2016 season as influenza activity was increasing in the US during Week 5 (1 February 2016). The HAN alert served to remind providers of the importance of beginning AV treatment for





high-risk patients (children under 2, adults over the age of 65, pregnant women, and those with certain medical conditions) or very ill patients as soon as possible after symptom onset, without waiting for confirmatory laboratory testing, as antiviral treatment for influenza is most effective if administered during the first 48 hours after symptom onset. The alert also recommended that clinicians continue to encourage patients to get immunized against influenza.<sup>9</sup>

The 2015-2016 influenza season was milder than the past three seasons and began later than the 2014-2015 season. The CDC reported that influenza activity began to increase in late December and peaked in mid-March, one of the latest seasons on record. Early in the season the H3N2 strain of influenza was dominant, but the H1N1 strain of influenza was the predominant strain for the season in all US Department of Health and Human Services regions.<sup>10</sup> These strains matched the vaccine; the CDC estimates the vaccine effectiveness for the season was 47%.<sup>11</sup> The highest rate of influenza-associated hospitalization was among adults over 65 years of age. According to the CDC, pneumonia- and influenza-associated mortality exceeded epidemic thresholds in the US for one three-week period beginning in early January 2016 and one four-week period beginning at the end of February 2016.<sup>12</sup> The weekly percentage of deaths attributed to pneumonia and influenza peaked at 7.9%, which is lower than for each of the past three seasons.<sup>12</sup>

Influenza is a concern for military service members as they are at increased risk of infection due to exposure from crowded living conditions, stressful work environments, and deployments to endemic regions.<sup>13</sup> Seasonal influenza vaccination is required annually for all active duty (AD) service members and recruits. For the 2015-2016 season, the DOD set a goal of 90% influenza vaccination coverage for service members by 15 December 2015.<sup>14</sup>

The EpiData Center (EDC) Department at the Navy Marine Corps Public Health Center (NMCPHC) began DOD and DON influenza surveillance during the 2008-2009 season using HL7 formatted laboratory and pharmacy data. The EDC has retrospective influenza surveillance data starting with the 2005-2006 season. From 2008 to 2010, the EDC was funded by the DOD Global Emerging Infections Surveillance and Response System (GEIS) program to provide information about influenza laboratory testing and influenza-specific AV treatment at facilities within the Military Health System (MHS). At the start of the 2011-2012 influenza season, the DON report was expanded to include a variety of other data sources available to the EDC. The comprehensive DON Situational Report (SITREP) includes information on influenza medical event reports (MERs), bacterial coinfections among influenza cases, vaccination coverage, relevant influenza-related news, and more detailed information about AD service members and recruits, hospitalized patients, and other vulnerable populations. The SITREP is developed weekly and distributed to the military public health community, as well as published to the EDC website (<http://go.usa.gov/DtUC>). Through timely surveillance of influenza activity, information can be disseminated to the preventive medicine community and clinicians, ensuring ongoing situational awareness of ever-evolving influenza trends throughout the influenza season. During the off-season, analysts at the EDC continue to monitor influenza activity and produce a monthly report.





## Methods

EDC influenza surveillance followed the seasonal and week definitions as specified by the CDC. The influenza season for the Northern Hemisphere typically lasts from the first week in October through the last week of March (Weeks 40 through 13). To account for the later than usual start and peak for the 2015-2016 season, this report encompasses Week 40 through Week 17. Based on CDC business rules, a week is defined as the period from Sunday through Saturday.<sup>15</sup> The EDC developed a standard method for applying week numbers to current and historical data, which allows for easy comparison across seasons. This method adjusts for years with 53 weeks, which occurred most recently during the 2014-2015 season.

EDC pharmacy and laboratory data originate from the Composite Health Care System (CHCS) and were made available daily from the Defense Health Surveillance System (DHSS) within approximately two days of record generation. These data were originally in the HL7 format and contain information for DOD beneficiaries and their dependents who sought care at a fixed military treatment facility (MTF). On a weekly basis, an extract of laboratory and pharmacy data for influenza analysis was created, containing cumulative data with a start date of September 20, 2015 (Week 38) through Saturday of the most current week. Data collection began two weeks before the start of the season (Week 40) to provide context of influenza activity at the initiation of seasonal surveillance and to identify cases that may have overlapped between weeks. A cumulative data extract allowed for the capture of updated and changed records that were identified in previous weeks.

Cases were classified as inpatient or ambulatory based on the data source and Medical Expense and Reporting System (MEPRS) code in the record. Pharmacy and encounter records for inpatient and ambulatory clinics were stored in separate databases and classified according to their source. The MEPRS code field was used to determine whether a laboratory record was from the inpatient setting as a proxy for higher severity; MEPRS codes beginning with 'A' indicate inpatient facilities. The MEPRS codes were used to distinguish records from emergency rooms (MEPRS codes beginning with 'BI') from other ambulatory clinics.

Baseline and historical data were used to compare trends for the 2015-2016 season to those of past seasons. The EDC calculated baselines by using a three-year weighted average, where more recent seasons held higher weights than previous seasons. Standard deviations were calculated for baselines for comparison of current season to trends of recent seasons. Historical data were also incorporated to show trends for past seasons.

The DOD officially transitioned to International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes for recording diagnoses on October 1, 2015. Trends prior to the transition are based on queries for International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes. Following the transition, data pulls from ambulatory and inpatient databases include queries for both ICD-9-CM and ICD-10-CM codes to account for potential lags in coding practices. Appendix A provides a detailed list of the ICD-9-CM and ICD-10-CM codes used in the analysis; additional information is also provided below.



## Database Alignment

Data extracted from laboratory records, pharmacy records, the Comprehensive Ambulatory/Professional Encounter Record (CAPER), and the Standard Inpatient Data Record (SIDR) were aligned in order to estimate the overall burden of influenza across the DON. Database alignment was also used to assess the relationship among databases and to determine the extent to which cases overlapped within laboratory, pharmacy, and encounter records. The ICD-9-CM and ICD-10-CM codes used to identify pertinent encounter records can be found in Appendix A. A 14 day gap-in-care rule was applied to identify unique cases. This rule meant that for a second case to occur in the same patient, at least 14 days must have elapsed between positive laboratory tests, AV prescriptions, or influenza encounters. Cases were classified into groups by record source(s): pharmacy only, laboratory only, encounter only, or a combination of two or more.

## Laboratory

Chemistry and microbiology data were used to identify positive influenza laboratory results. The laboratory data were limited to relevant clinical specimen sources, including throat and nasal sources. Results were included for all influenza test types: rapid tests, polymerase chain reaction (PCR) tests, direct fluorescent antibody (DFA) tests, and cultures. The influenza type (A, B, A and B, or nonspecific) was determined for positive test results. Because patients may have had multiple influenza tests performed over the course of an illness, a 14-day gap-in-care rule was applied to identify cases. A beneficiary must have had a 14 day lapse since his or her previous positive influenza test result to be counted as a new case. Rates per 100,000 by age group and by service were calculated using the Military Health System (MHS) Management and Analysis Reporting Tool (M2) September 2015 enrollment data for denominators.

## Pharmacy

The ambulatory, inpatient, and intravenous pharmacy databases were used to identify prescriptions for influenza-specific AV medications. There are five AV medications approved by the US Food and Drug Administration (FDA) for influenza treatment. Three of these AVs were recommended by the CDC for use during the 2015-2016 influenza season, including oral oseltamivir (Tamiflu), inhaled zanamivir (Relenza), and intravenous peramivir (Rapivab). Due to AV resistance, amantadine and rimantadine were not recommended for AV treatment or chemoprophylaxis of currently circulating influenza A viruses. The analyses included all five drugs of interest to assess provider prescription practices.<sup>16</sup>

Records with canceled or unknown prescription status, or where no medication was dispensed, were excluded from the final dataset as these prescriptions were likely not distributed from the MTF pharmacy. Amantadine is also used for the treatment of movement disorders, such as Parkinson's disease; prescriptions for this purpose were distinguishable from influenza treatment prescriptions based on the dosage, duration, and number of refills indicated in the pharmacy record, and were excluded from influenza surveillance. Because patients may receive more than one AV prescription for a single illness, a 14 day gap-in-treatment rule was applied. Beneficiaries were considered a new case if there was a 14 day lapse since their previous AV treatment.



## Inpatient Comorbidities

The comorbidities most often associated with inpatient laboratory-positive cases and influenza AV prescriptions are of interest due to the possible antagonistic relationship between influenza and other diseases. To obtain diagnosis information on possible comorbidities, inpatient laboratory and pharmacy records were matched to inpatient admissions and ambulatory encounter records. The inpatient analysis included records where either the laboratory collection date or pharmacy transaction date was between the admission and disposition date. The ambulatory record analysis included encounter data where the encounter date occurred 14 days before or after the laboratory collection date or the pharmacy transaction date. Clinical Classifications Software (CCS) groupings were used to classify ICD-9-CM and ICD-10-CM diagnosis codes into corresponding diagnosis categories. Unique diagnosis categories were counted once per case; cases may have been classified in more than one diagnosis category.

## Encounter ILI Diagnosis Tracking

Each week, influenza-like illness (ILI) diagnoses among DON beneficiaries were monitored in medical encounter data using Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE)-defined syndromic ICD-9-CM and ICD-10-CM codes (Appendix A). The percentage of medical encounters containing an ILI diagnosis was calculated to evaluate the number of diagnoses in relation to healthcare utilization at fixed MTFs; denominators were established by aggregating the total number of encounters for the corresponding week using unique appointment identifiers. Inpatient and ambulatory records, including those from emergency room (ER) visits, were evaluated.

## DRSi

The internet-based Disease Reporting System (DRSi) is utilized by all military service branches for notification of reportable conditions, as indicated in the Armed Forces Reportable Medical Event Guidelines.<sup>18</sup> Reported cases of influenza-associated hospitalization were extracted weekly from DRSi. According to the Armed Forces Reportable Medical Event Guidelines, influenza-associated hospitalization is defined as an illness compatible with influenza virus infection requiring hospitalization of patients less than 65 years of age, along with laboratory test confirmation or a positive rapid test result less than four days after hospital admission. Medical event reports which indicated an influenza-associated hospitalization were compared to inpatient cases of influenza identified through laboratory and pharmacy surveillance efforts.

## Coinfections

### Microbiology Isolates

To determine if a beneficiary with laboratory-confirmed influenza was coinfecting with bacterial organisms, influenza-positive cases were matched to the microbiology database within 14 days of the influenza specimen collection date. Matching records were restructured using the BACLINK<sup>®</sup> and WHONET<sup>®</sup> software programs developed by the WHO to identify bacterial infections as well as analyze antimicrobial resistance data. To include all possible cases, hand review of matching laboratory records was completed to capture any records not included in the expected format. Due to small case numbers, coinfections were grouped by genera and



antimicrobial resistance could not be analyzed.

Specimens were classified as upper, lower, or non-respiratory infections using an algorithm developed by the Clinical Epidemiology Division at the EDC. An upper respiratory infection (URI) was defined as one isolated above the larynx (e.g., pharynx, ear, sinus), and a lower respiratory infection (LRI) included tracheal, sputum, or bronchial specimens. Records with nonspecific or other specimen (e.g., swab, blood) were classified as non-respiratory infections.

### Radiology-Identified Pneumonia

Laboratory-identified influenza cases were matched to radiology records to identify positive or suspect pneumonia cases; radiology records were considered where the order effective date was within seven days of the laboratory specimen collection date. Although positive radiology results do not necessarily indicate a clinical diagnosis of pneumonia, surveillance of influenza cases with a positive radiology result can identify potential pneumonia cases before physician diagnoses within encounter records or may indicate complications.

### Vaccination

Data was extracted from the Medical Readiness Reporting System (MRRS) to determine vaccination coverage among AD and reserve DON personnel. MRRS provides an aggregated number of vaccinated AD and reserve service members, total eligible, and total exempt in each component. MRRS data were also used to assess vaccination coverage in the Central Fleet Forces Command and Pacific Fleet Command. Fleet Forces vaccinations were monitored on a weekly basis throughout the season to track progress in relation to the DOD goal of 90% immunized by 15 December 2015. The percent of personnel immunized was calculated using the number of personnel vaccinated divided by the number eligible in each command.

In addition to the overall vaccination coverage rate, AD personnel with a positive influenza laboratory result were matched to patient-level data within the Immunization Tracking System (ITS) data to determine seasonal influenza vaccination status at the time of illness. Service members who received the vaccine at least 14 days before the specimen collection date were considered fully immunized. The type of vaccine administered—inactivated influenza vaccine (IIV) or live-attenuated influenza vaccine (LAIV)—was also assessed using the common vaccine code (CVX) to validate vaccination status. Service members with vaccination records from 01 August 2015 through 30 April 2016 were included to calculate the proportion of vaccinated active duty and reserve personnel.

Influenza vaccination was monitored for DOD beneficiaries to track the volume of vaccines administered and anticipate potential vaccine demand throughout the influenza season at the MTF level. Ambulatory encounters with a Current Procedural Terminology (CPT) code for an influenza vaccination administered in a Navy MTF from 01 September 2015 through 31 March 2016 were evaluated. Duplicate vaccination procedure records that occurred on the same day were not included in the analysis. If more than one influenza-related CPT code existed for a single encounter, the first influenza-related code was used. All encounters for a beneficiary were retained if they occurred on different days.

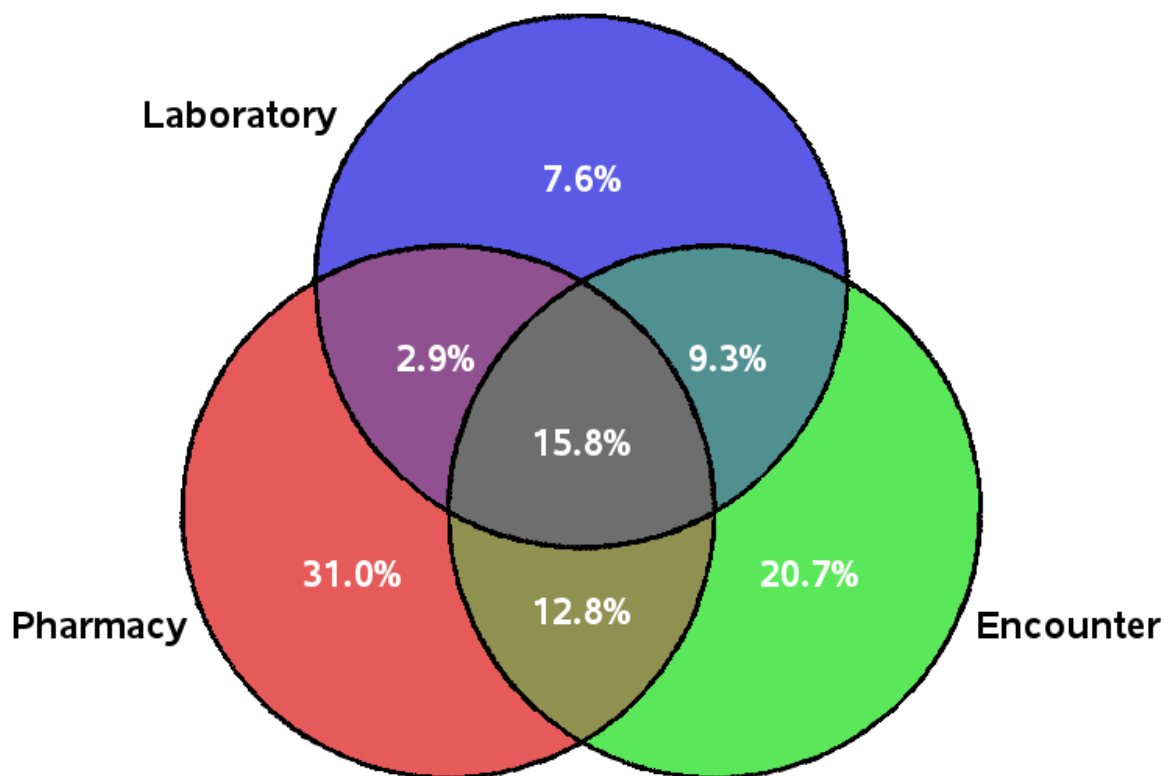


## DON Results

### Database Alignment

The total number of influenza cases identified from laboratory, pharmacy, and encounter (ambulatory and inpatient) records among DON beneficiaries was 6,377 for the 2015-2016 season. Cases were most frequently identified in pharmacy data (62.5%), followed by encounter (58.6%) and laboratory (35.5%) data sources. Almost 41% of cases aligned with two or more data sources; 15.8% of cases aligned with all three data sources. However, 59.3% of cases were found in a single data source (Figure 1). These results indicate that single source surveillance would omit a significant number of potential influenza cases.

**Figure 1.** DON Influenza Cases by Source (Non-Proportional) During the 2015-2016 Season, Total Cases =6,377



Data sources: HL7-formatted CHCS chemistry, microbiology, and pharmacy data and Comprehensive Ambulatory/Professional Encounter Record (CAPER) and Standard Inpatient Data Record (SIDR) . Due to systematic data lags, ambulatory encounter and inpatient admission records are subject to update.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

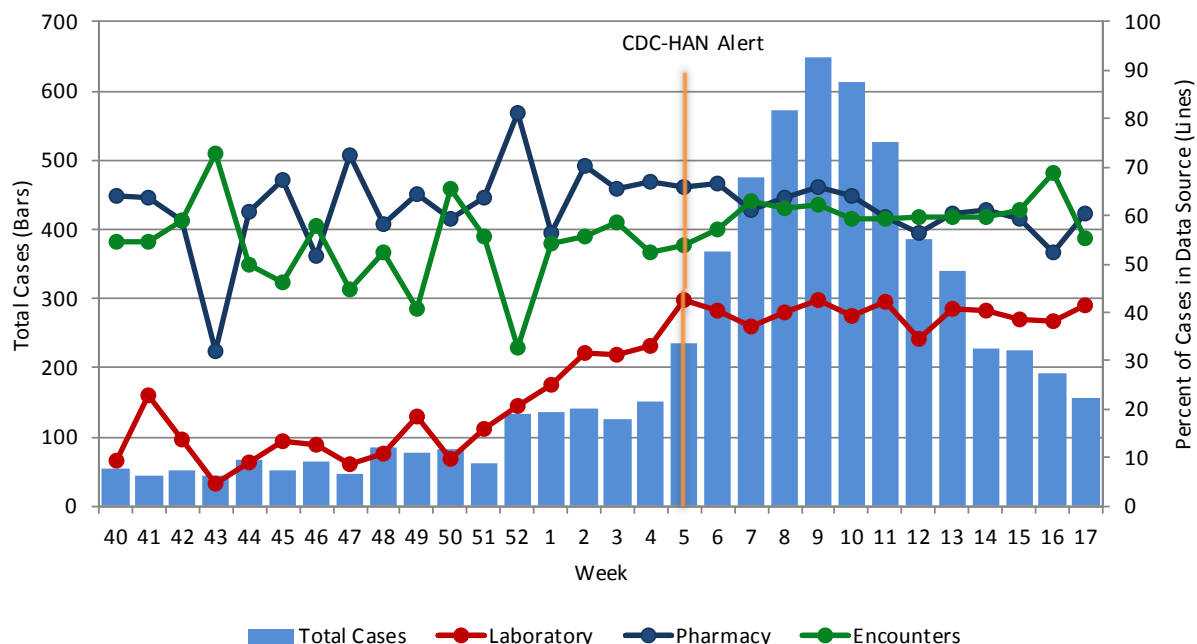
Overall influenza cases peaked at Week 9 with 648 cases (Figure 2); individually, laboratory,





pharmacy, and encounter cases peaked during the same week (data not shown). By week, the highest proportion of cases occurred in either pharmacy (31.8% to 81.1%) or encounter data (32.6% to 72.7%). The proportion of cases identified in laboratory data accounted for the fewest cases throughout the season, beginning at 9.4% and increasing each week from Week 51 through Week 5 to a high of 42.6%; the proportion remained above 34.5% for the remainder of the season (Figure 2). The CDC released one HAN alert during Week 5, reminding healthcare providers of the benefits of AV treatment. Historically, HAN alerts may coincide with an increase in the identification of pharmacy cases. During the 2015-2016 season, case identification increased in all data sources from Week 5 through Week 9. Specifically, total cases increased by 55.6% from Week 4 to Week 5 and increased by 56.2% from Week 5 to Week 6.

**Figure 2.** DON Influenza Cases by Data Source, with Timing of the CDC-HAN\* Alert, 2015-2016 Season



\*CDC Health Alert Network

Data sources: HL7-formatted CHCS chemistry, microbiology, and pharmacy data and Comprehensive Ambulatory/Professional Encounter Record (CAPER) and Standard Inpatient Data Record (SIDR). Due to systematic data lags, ambulatory encounter and inpatient admission records are subject to update.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.





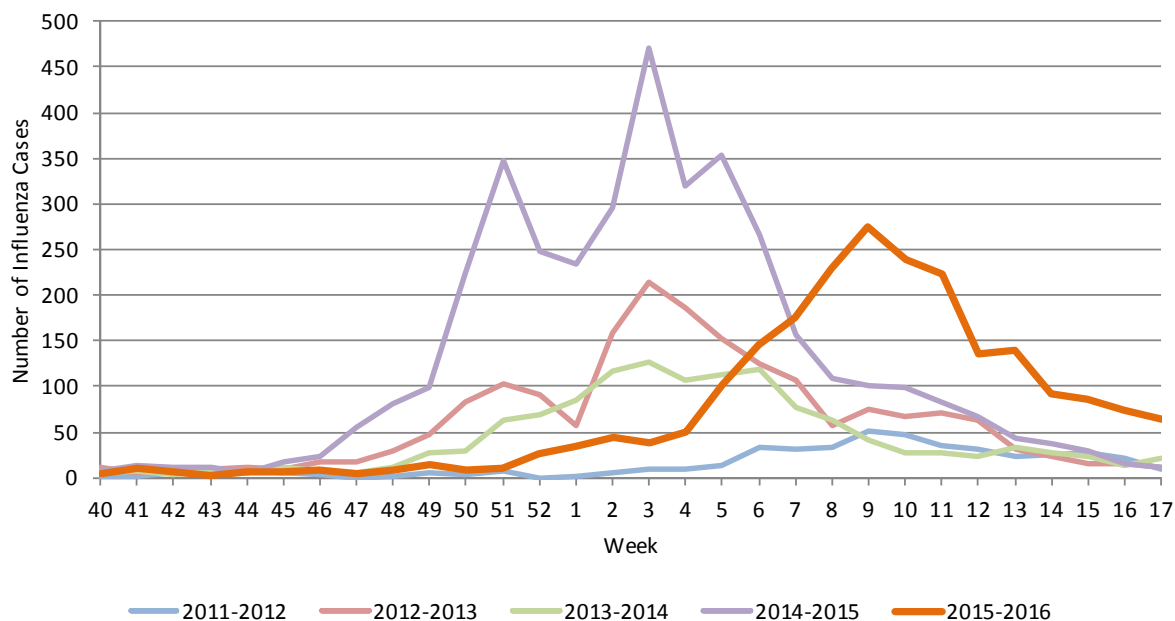
## Laboratory

### Overall

The volume of laboratory-positive influenza cases among DON beneficiaries during the 2015-2016 season was substantially less than for the 2014-2015 season. Laboratory cases exhibited a later peak when compared to the past three seasons. Laboratory-positive influenza cases reached a peak of 275 cases during Week 9 (Figure 3). The number of laboratory cases was above baseline levels from Week 7 through Week 17. During Weeks 9-11, cases exceeded two standard deviations above the baseline (Figure 4).

Approximately 14.5% (n=2,499) of the 17,238 unique specimens tested for influenza were positive. The most frequent type of tests used to process specimens were rapid diagnostic tests (64.5%), followed by PCRs (33.3%), cultures (2.0%), and DFAs (0.2%). The total number of laboratory-positive cases was 2,266 among 2,262 DON beneficiaries. Four beneficiaries had two laboratory positive cases of influenza during the season. The time between cases varied from 22 days to almost five months (149 days). No beneficiaries had more than two cases of influenza during the season. The cases were unevenly distributed among the different types of influenza virus: 1,572 (62.9%) influenza A, 887 (35.5%) influenza B, 28 (1.1%) influenza A and B, and 12 (0.5%) cases with an unknown influenza type.

**Figure 3.** Frequency of Positive Influenza Laboratory Cases among DON Beneficiaries, 2011-2016 Seasons

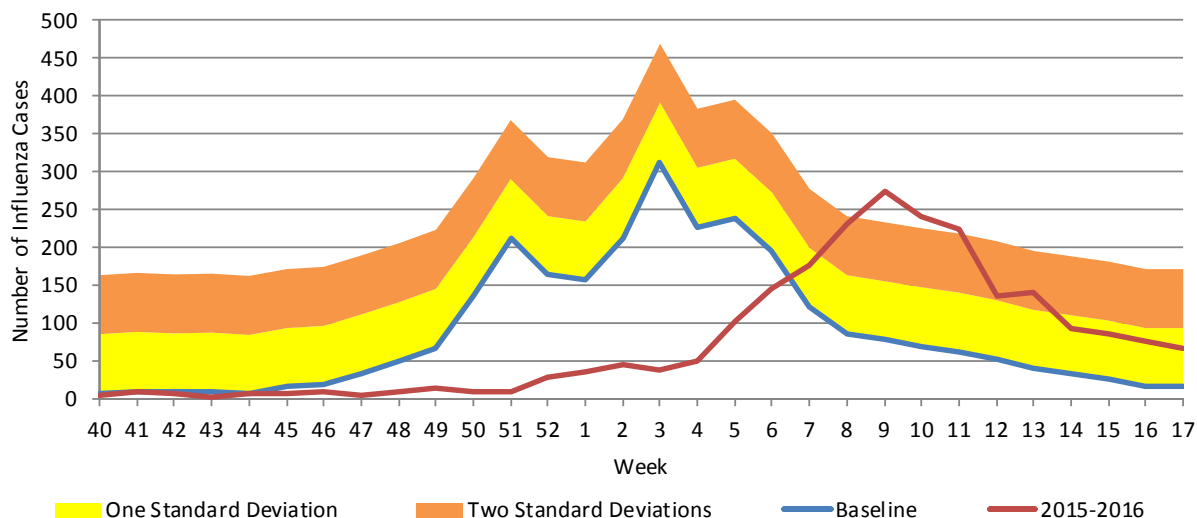


Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



**Figure 4.** Frequency of Laboratory-Positive Influenza Cases among DON Beneficiaries in Comparison with Seasonal Baseline, 2015-2016 Season



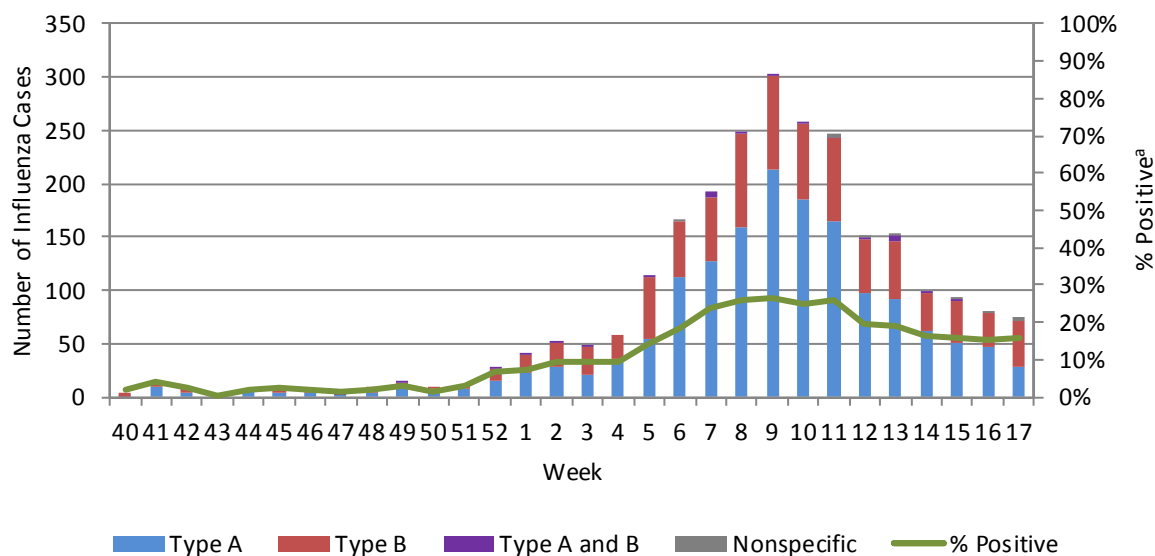
Baseline calculated as the weighted average of the number of influenza-specific antiviral prescriptions in the 2012-2013, Data source: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



Overall, 14.5% of specimens tested positive for influenza in the 2015-2016 season. The highest percentage of positive specimens emerged during Week 10 (26.4%). The percentage of positive specimens rose above 10% during Week 5 and remained elevated above 10% through Week 17 (Figure 5).

**Figure 5.** DON Laboratory-Positive Influenza Tests by Influenza Type, 2015-2016 Season



<sup>a</sup>Percent positive reflects the proportion of all unique specimens tested for influenza that were positive.  
 Data sources: HL7-formatted CHCS chemistry and microbiology data.  
 Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



NMC San Diego had the largest number of positive influenza cases during the season, followed by NH Jacksonville and NH Camp Pendleton (See Table 1). The majority of cases were Navy beneficiaries (n=1,546); 720 cases were among Marine Corps beneficiaries. The greatest frequency of Navy beneficiary cases was at NMC San Diego (n=198), followed by NH Jacksonville (n=167) and NH Bremerton (n=109), while the highest frequencies of cases among Marine Corps beneficiaries were at NH Camp Lejeune (n=127), NH Camp Pendleton (n=124), and NMC San Diego (n=64). During the season, locations outside of the continental US (OCONUS) had 160 laboratory positive cases, most frequently at NH Yokosuka (n=70), NH Okinawa (n=25), and NH Guam-Agana (n=22) (data not shown).

**Table 1.** Top Three DON Facilities with the Highest Frequency of Laboratory-Positive Influenza Tests by Beneficiary Service, 2015-2016 Season

Service	Facility	Frequency (%)
Navy (n=1,546)	NMC San Diego	198 (12.8%)
	NH Jacksonville	167 (10.8%)
	NH Bremerton	109 (7.0%)
Marine Corps (n=720)	NH Camp Lejeune	127 (17.6%)
	NH Camp Pendleton	124 (17.2%)
	NMC San Diego	64 (8.9%)
Overall (n=2,266)	NMC San Diego	262 (11.6%)
	NH Jacksonville	179 (7.9%)
	NH Camp Pendleton	163 (7.2%)

Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

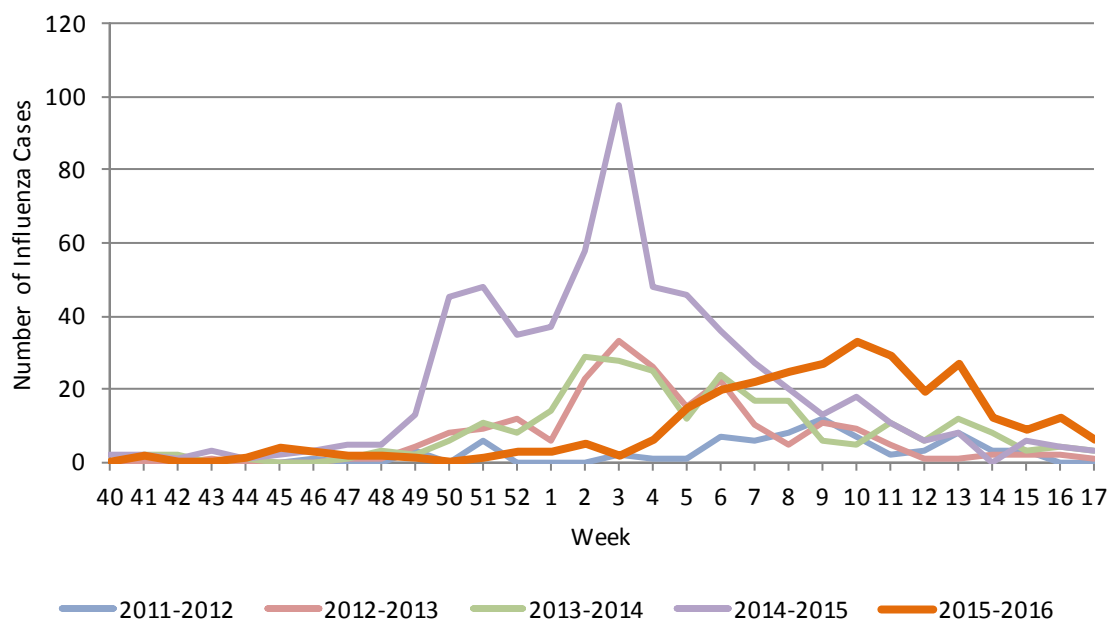
## Active Duty and Recruits

The DON had 291 AD laboratory-positive influenza cases among 290 beneficiaries (215 Sailors and 76 Marines) during the 2015-2016 season. Among DON AD cases, 215 were influenza A, 70 were influenza B, 4 were influenza A and B, and 2 had no influenza type identified. One AD service member accounted for two laboratory-positive cases, one influenza B positive, and one influenza A and B positive, with a gap of nearly 5 months (149 days) between the cases. Seventy-one laboratory-positive influenza cases occurred among recruits (58 influenza A, 9 influenza B, and 4 both influenza A and B). Recruit cases consisted of 21 among Sailors (29.6%) and 50 among Marines (70.4%).

The seasonal trend of DON AD influenza cases was mostly consistent with the trend for all DON beneficiaries, demonstrating a peak at Week 10; however, the AD trend showed a slight uptick at Week 13 after cases had declined for two weeks. The 2015-2016 season frequency of AD cases was lower than the 2014-2015 season, but higher than the 2012-2013 and 2013-2014 seasons (Figure 6).



**Figure 6.** DON Laboratory-Positive Influenza Cases, Active Duty Service Members, 2011-2016 Seasons



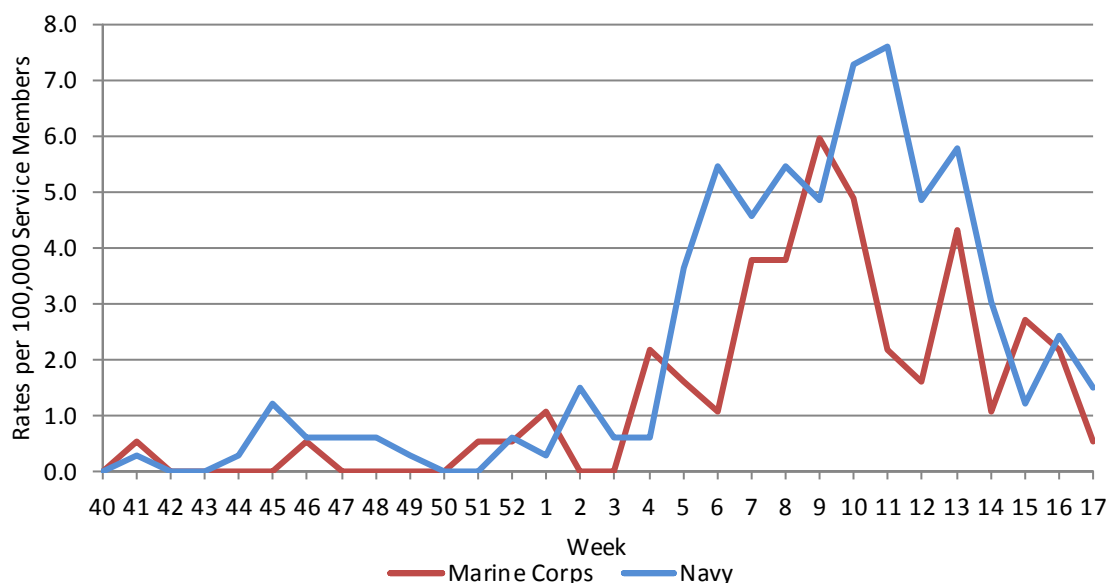
Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



Influenza rates for AD Sailors and Marines were similar; however the peak rate for Sailors occurred during Week 11 (7.6 per 100,000) and the peak rate for Marines occurred two weeks earlier at Week 9 (6.0 per 100,000). The rate for Marines had a second peak at Week 13 (4.3 per 100,000). The rate for Sailors was higher than that of Marines for 24 out of 30 weeks; conversely, during the 2014-2015 season, rates for Marines exceeded those of Sailors for 13 out of 25 weeks (Figure 7).

**Figure 7.** Rates of DON Laboratory-Positive Influenza Cases by Service, per 100,000 Active Duty Service Members, 2015-2016 Season



Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

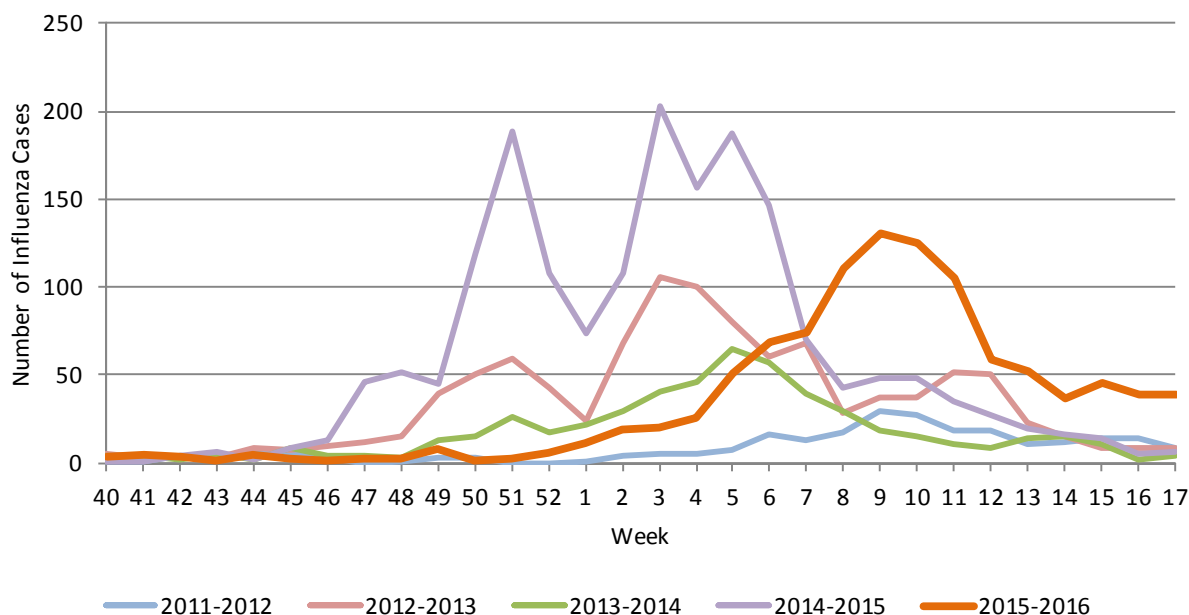




## Children and Other Age Groups

Mirroring overall DON beneficiary trends, the frequency of influenza cases among children (aged 0-17 years) in 2015-2016 was lower than for the previous season and exhibited a later peak than in recent seasons (Figure 8). The volume of influenza cases among children peaked during Week 9 (n=131) and declined for seven of eight weeks thereafter.

**Figure 8.** Frequency of Influenza Laboratory Cases among DON Children Ages 0-17, 2011-2016 Seasons



Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

Influenza rates for all age groups among DON beneficiaries were monitored throughout the season (Table 2). The average rates in children (0-4 and 5-17 age groups) were higher than in other age groups, and those aged 0-4 years exhibited the highest average and peak case rates. The rate for all age groups peaked in either Week 9 or Week 10.

**Table 2.** Rates of DON Laboratory-Positive Influenza Cases by Age Group, 2015-2016 Season

Age Group	Average Rate (Per 100,000)	Peak Rate (Week) (Per 100,000)	# of Weeks at 0 Cases
0-4	10.1	40.7 (9)	4
5-17	7.9	31.1 (10)	1
18-44	2.8	8.9 (9)	1
45+	4.4	17.8 (9)	3

Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

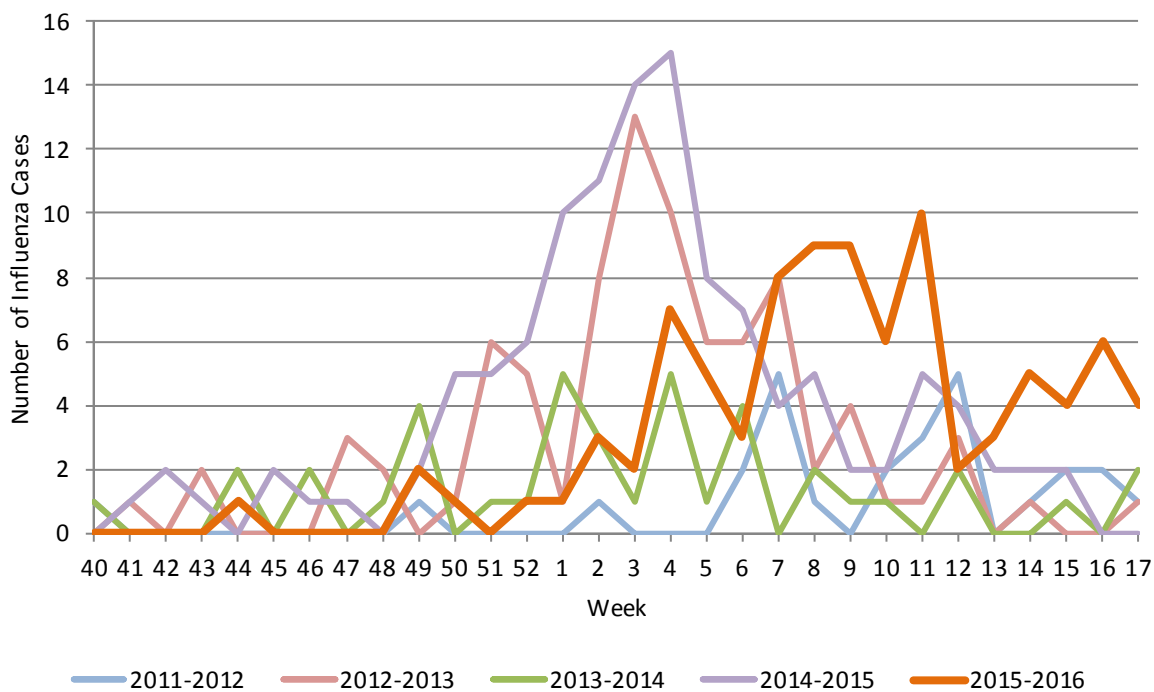


## Inpatient Cases

The total inpatient case burden among DON beneficiaries in the 2015-2016 season was lower than the prior season, but higher than the 2013-2014 and 2012-2013 seasons (Figure 9). There were 1,500 specimens collected in the inpatient setting among 1,247 DON beneficiaries; 6.9% of the specimens tested positive for influenza. Ninety-two laboratory-positive inpatient influenza cases occurred among DON beneficiaries (55 influenza Type A, 37 influenza Type B).

Inpatient cases accounted for 4.1% of all influenza cases during the 2015-2016 season. The percentage of inpatient cases for the current season was comparable to that of the 2014-2015 influenza season (3.1%). The inpatient proportion of cases exceeded baseline rates for 16 out of 30 weeks. The average age of an inpatient case was 58 years (range: 0 to 93). Inpatient cases consisted of nine children aged 0-4 years, ten children aged 5-17 years, 17 adults aged 18-44 years, and 56 adults aged 45 years and older. Six inpatient cases were AD service members (all Sailors) and six were Marine Corps recruits. Inpatient cases peaked during Week 11 with ten cases (Figure 9).

**Figure 9.** Frequency of Inpatient Influenza Laboratory Cases among DON Beneficiaries, 2011-2016 Seasons



Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

The locations with the highest number of DON inpatient laboratory cases were NMC San Diego (n=55), Brooke Army Medical Center-Fort Sam Houston (n=7), and NMC Portsmouth (n=6). Two OCONUS inpatient cases occurred at NH Guam-Agana.



## Inpatient Comorbidities

The 92 unique laboratory-confirmed inpatient cases were matched to inpatient admission and outpatient encounter data to identify comorbid diagnoses. All cases had at least one outpatient record and 71 cases had an inpatient admission record with the laboratory specimen collection date occurring within 14 days of the encounter or between the inpatient admission and disposition dates. The median duration between admission and discharge for patients with an inpatient admission record was 2 days, with a maximum duration of 22 days.

Influenza was the most common diagnostic category for laboratory-confirmed inpatient cases found among inpatient admissions and outpatient encounters (Table 3). The next most frequent comorbidities were 'other lower respiratory disease' (n=53), essential hypertension (n=48), pneumonia (n=32), and cardiac dysrhythmias (n=30), not including administrative codes (administrative/social admissions, residual codes, unclassified, and other aftercare--which includes routine examinations, screening).

**Table 3.** Twenty Most Common Comorbidities among Inpatient DON Influenza Laboratory Cases, 2015-2016 Season (n=92)

Diagnostic Category	Frequency	Percent
Influenza	78	84.8%
Administrative/social admission	72	78.3%
Other lower respiratory disease	53	57.6%
Essential hypertension	48	52.2%
Residual codes; unclassified	39	42.4%
Other aftercare	33	35.9%
Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	32	34.8%
Cardiac dysrhythmias	30	32.6%
Fluid and electrolyte disorders	30	32.6%
Disorders of lipid metabolism	29	31.5%
Fever of unknown origin	29	31.5%
Diabetes mellitus without complication	28	30.4%
Deficiency and other anemia	26	28.3%
Other connective tissue disease	25	27.2%
Other screening for suspected conditions (not mental disorders or infectious disease)	24	26.1%
Screening and history of mental health and substance abuse codes	24	26.1%
Asthma	20	21.7%
Chronic obstructive pulmonary disease and bronchiectasis	20	21.7%
Other gastrointestinal disorders	19	20.7%
Other upper respiratory infections	19	20.7%

Note: Cases may be classified within more than one diagnostic category.

Data source: Standard Inpatient Data Record (SIDR) and Comprehensive Ambulatory/Professional Encounter Record (CAPER).

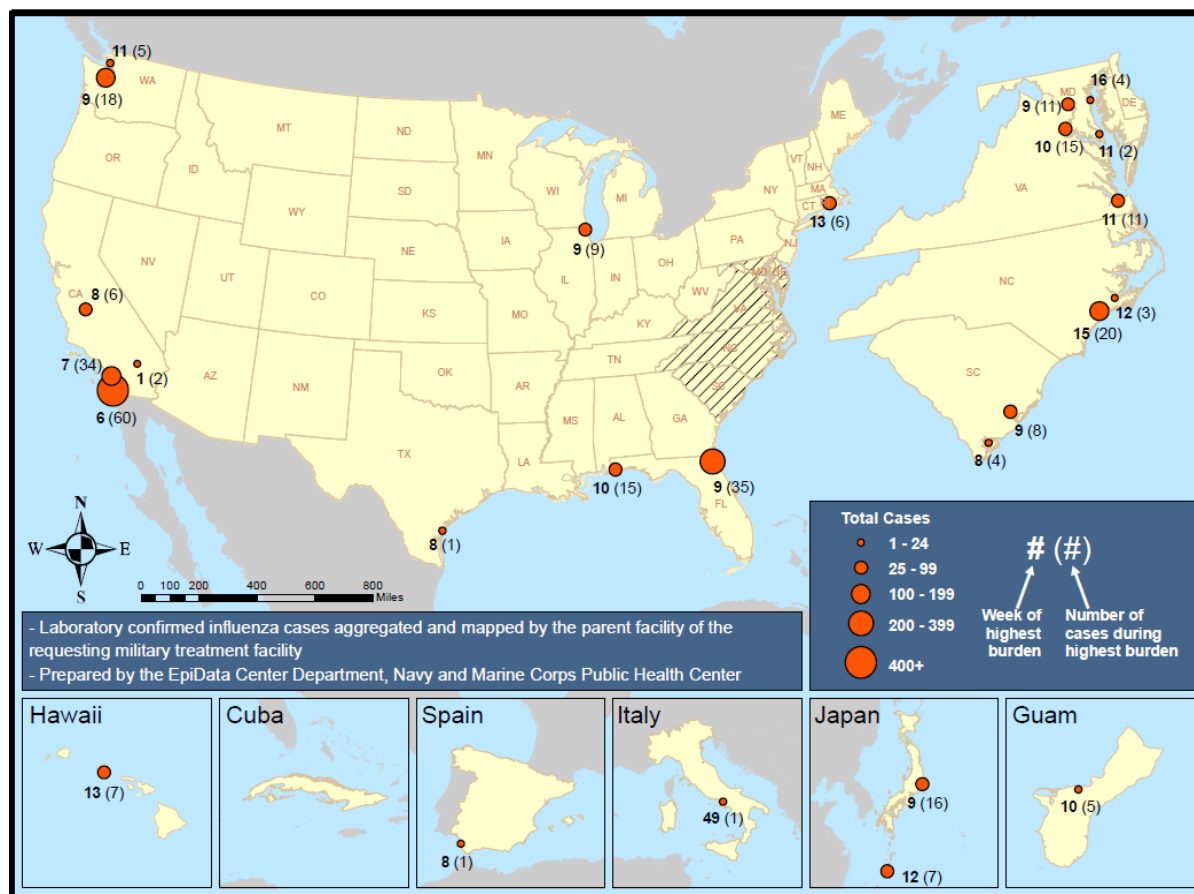
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## Geographical Distribution

Navy parent MTFs in the mid-Atlantic, Southeast, and Pacific Northwest United States experienced their highest burden of laboratory-positive influenza cases later than those located in California and OCONUS. Spain and Italy had a maximum of one case during any week for the season; the week when this first occurred is displayed on the map (Figure 10).

**Figure 10.** Laboratory-Positive Influenza Cases by Parent Facility and Week of Highest Burden, DON Beneficiaries at DON Facilities and Walter Reed National Military Medical Center, 2015-2016 Season



Data source: HL7-formatted CHCS microbiology and chemistry data.

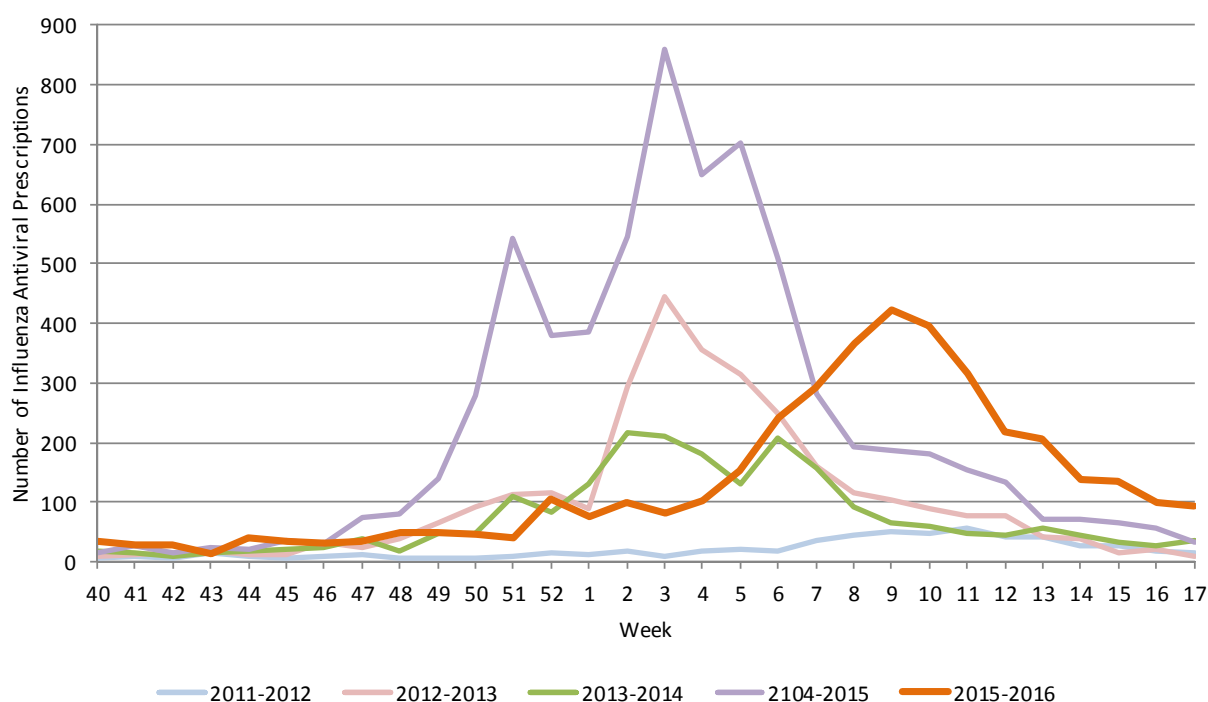
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

## Pharmacy

### Overall

The frequency of influenza-specific AV prescriptions dispensed among DON beneficiaries was generally below historical trends during the 2015-2016 season (Figure 11). The volume began to increase during Week 4 and reached a peak during Week 9 (n=423) at more than three times the baseline (n=132); frequency remained above baseline through the end of the surveillance period. During Weeks 8 through 11 of the current season, the frequency of influenza AV prescriptions was two standard deviations above the baseline (Figure 12).

**Figure 11.** Frequency of Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries, 2011-2016 Seasons

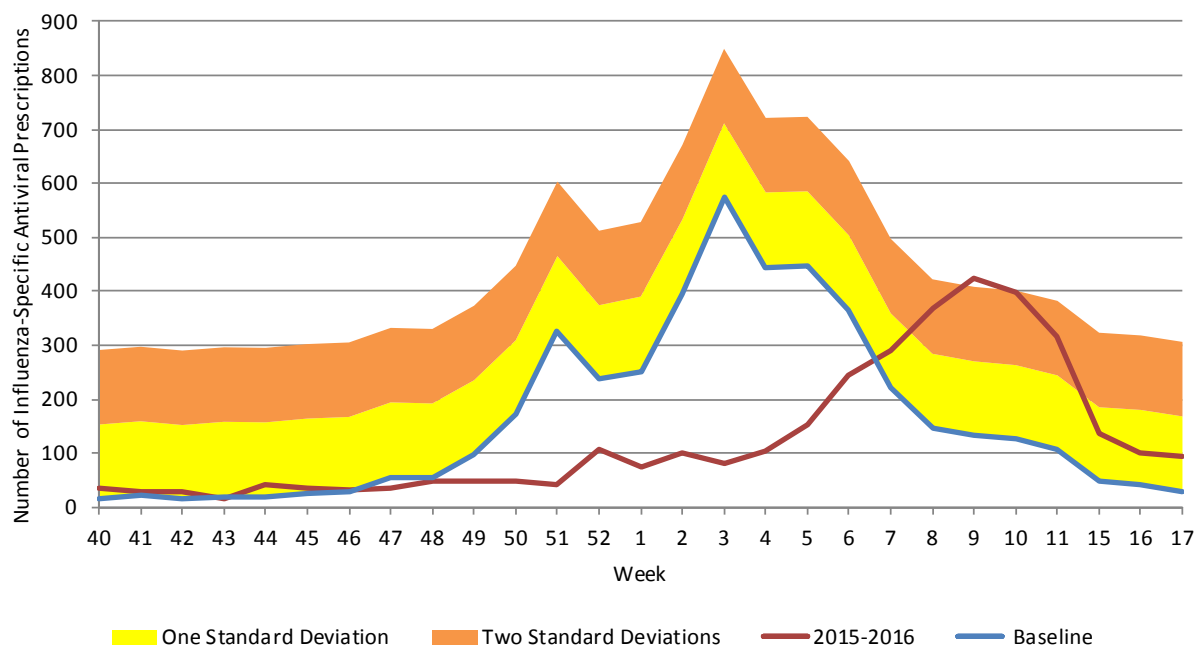


Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



**Figure 12.** Frequency of Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries in Comparison with Seasonal Baseline, 2015-2016 Season



Baseline calculated as the weighted average of the number of influenza specific antiviral prescriptions in the 2012-2013, 2013-2014, and 2014-2015 seasons.  
 Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

A total of 3,980 influenza AVs were prescribed to DON beneficiaries during the 2015-2016 influenza season. Oseltamivir was prescribed most frequently in both the inpatient and ambulatory settings; 33 amantadine and one zanamivir prescriptions were also dispensed (Table 4). No rimantadine or peramivir prescriptions were dispensed and no intravenous influenza-specific AVs were identified for DON beneficiaries.

**Table 4.** Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries by Facility Setting, 2015-2016 Season

Antiviral	Ambulatory (%)	Inpatient (%)	Total (%)
Amantadine	13 (0.3%)	20 (7.5%)	33 (0.8%)
Oseltamivir	3,699 (99.7%)	248 (92.5%)	3,947 (99.2%)
Total	3,712	268	3,980

Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.





Among the beneficiary categories, the highest frequency of AVs were distributed to children (36.9%), followed by spouses (29.0%) and active duty personnel (16.9%). The percentage of total AVs prescribed to children aged 0-4 years and 5-17 years was 13.4% and 20.9%, respectively (Table 5).

**Table 5.** Influenza Antiviral Prescriptions Dispensed to DON Beneficiaries by Gender, Age Group, and Beneficiary Category, 2015-2016 Season

	Frequency (%)
Total	3,980 (100%)
Gender	
Male	1,975 (49.6%)
Female	2,005 (50.4%)
Age Group	
0 - 4	534 (13.4%)
5 - 17	830 (20.9%)
18 - 44	1,434 (36.0%)
45+	1,182 (29.7%)
Beneficiary Category	
Active Duty	672 (16.9%)
Recruit	100 (2.5%)
Spouse	1,156 (29.0%)
Child	1,468 (36.9%)
Other: Sponsor	581 (14.6%)
Other: Non-Sponsor	3 (0.1%)

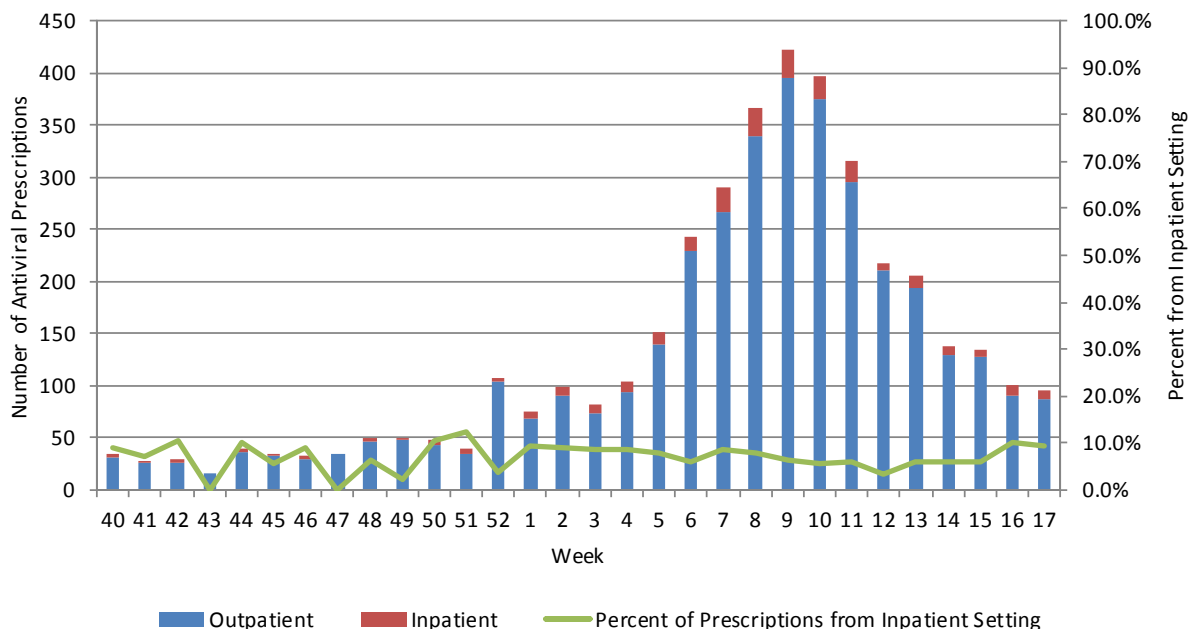
Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



Nearly seven percent of all influenza AVs were prescribed from an inpatient setting; the weekly percentage prescribed in an inpatient setting remained under 10% for all weeks except Week 51 (12.5%). Although the number of inpatient prescriptions increased from Week 5 through Week 11, it remained relatively proportional to the overall number of AVs prescribed to DON beneficiaries during this time (Figure 13).

**Figure 13.** Frequency of Influenza Antiviral Prescriptions and Percent Dispensed in an Inpatient Setting to DON Beneficiaries, 2015-2016 Season



Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



NMC San Diego had the largest number of influenza specific AVs dispensed during the 2015-2016 season, followed by NH Camp Lejeune and NH Camp Pendleton. By service, NMC San Diego (26.4%) and NH Camp Lejeune (22.8%) had the greatest frequency of AVs dispensed to Navy and Marine Corps beneficiaries, respectively (Table 6). OCONUS locations had 190 AV transactions (4.8%); NH Yokosuka (n=76), NH Okinawa (n=29), and NH Guam-Agana (20) had the highest number of cases (data not shown).

**Table 6.** Top Three DON Facilities with the Highest Frequency of Influenza Specific Antivirals by Service, 2015-2016 Season

Service	Facility	Frequency (%)
Navy (n=2,799)	NMC San Diego	739 (26.4)
	NH Jacksonville	209 (7.5)
	NH Pensacola	201 (7.2)
Marine Corps (n=1,181)	NH Camp Lejeune	269 (22.8)
	NMC San Diego	191 (16.2)
	NH Camp Pendleton	170 (14.4)
Overall (n=3,980)	NMC San Diego	930 (23.4)
	NH Camp Lejeune	310 (7.8)
	NH Camp Pendleton	265 (6.7)

Data source: HL7-formatted CHCS pharmacy data.

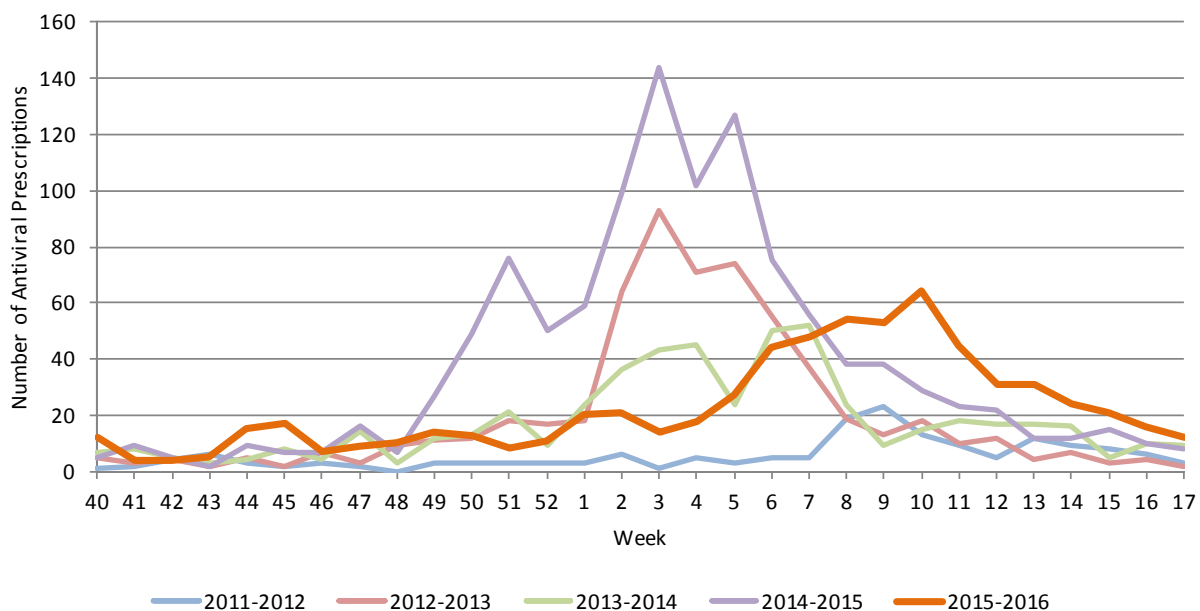
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## Active Duty and Recruits

The overall frequency of influenza AV prescriptions dispensed to DON AD personnel was lower this season than the previous season; 672 prescriptions were dispensed to AD personnel during 2015-2016 as compared to 1,138 prescriptions during the 2014-2015 season. Frequencies in the current season generally remained below that of the previous three seasons until Week 8, when the volume of AV prescriptions exceeded and remained above historical trends throughout the remainder of the surveillance period (Figure 14).

**Figure 14.** Frequency of Influenza Antiviral Prescriptions Dispensed to DON Active Duty Personnel, 2011-2016 Seasons



Data source: HL7-formatted CHCS pharmacy data.

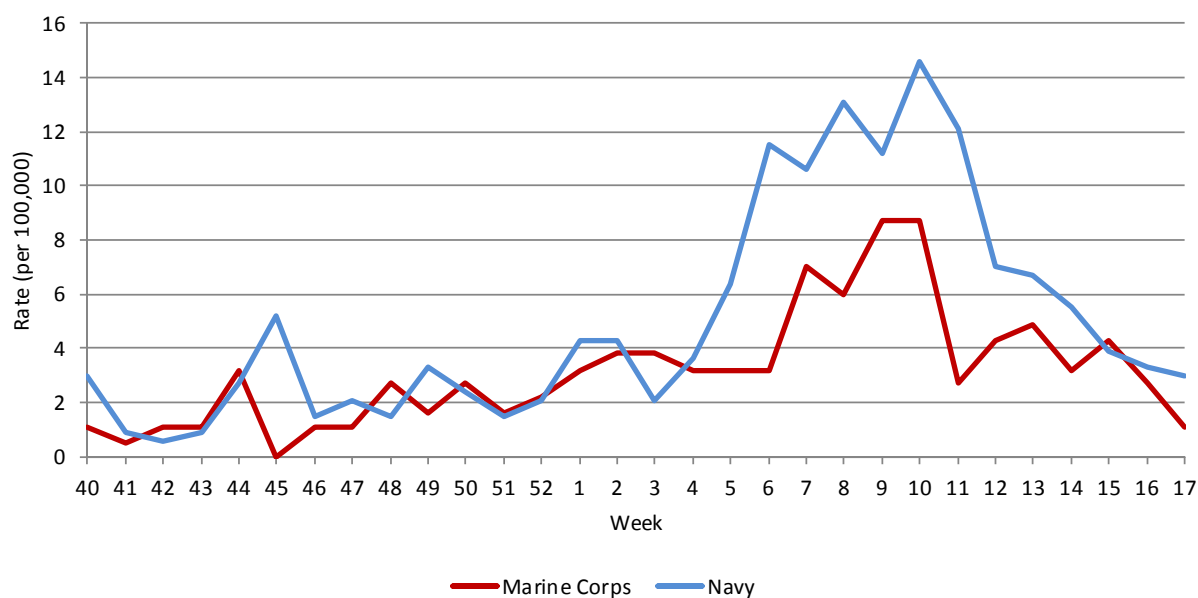
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

Overall, influenza AV prescription rates were higher for AD Sailors than AD Marines



throughout the 2015-2016 season. AV prescription rates among AD Sailors began to increase around Week 4, reaching a peak rate of 14.6 per 100,000 personnel during Week 10. The AV prescription rate increase for AD Marines began around Week 7, reaching a peak rate of 8.7 per 100,000 personnel during Weeks 9 and 10 (Figure 15).

**Figure 15.** Influenza Antiviral Prescription Rates (per 100,000) by Service, DON Active Duty Personnel, 2015-2016 Season



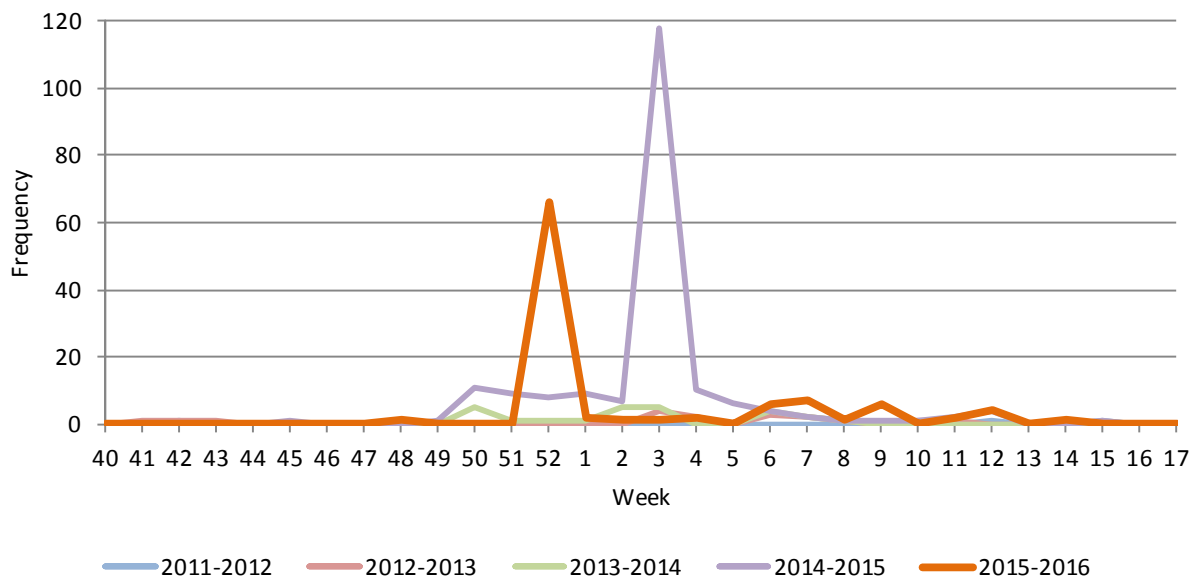
Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



The frequency of influenza AV prescriptions dispensed to DON recruits was lower this season than the previous season; in total, 100 prescriptions were dispensed to recruits during 2015-2016, as compared to 196 prescriptions in the previous season (Figure 16). A peak during Week 52 was due to an increase in AV prescriptions dispensed to Marine Corps recruits, two weeks earlier than a similar increase during the 2014-2015 season. Current season frequencies were generally slightly above the previous seasons from Week 6 through Week 12.

**Figure 16.** Frequency of Influenza Antiviral Prescriptions Dispensed to DON Recruits, 2011-2016 Seasons



Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

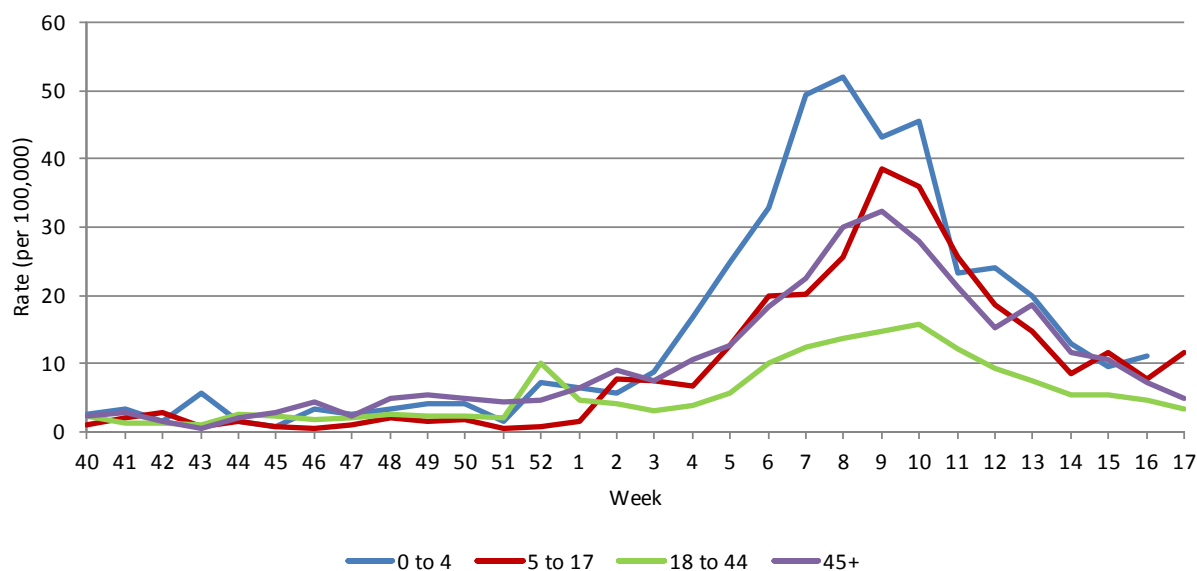




## Children and Other Age Groups

Overall rates of influenza AV prescriptions among DON beneficiaries were highest among children aged 0-4 years, peaking during Week 9 (51.9 prescriptions per 100,000 children). Rates among children aged 5 to 17 were lower (38.4 per 100,000 children) during the same week. Beneficiaries aged 45 years and above followed a similar trend as the other age groups, reaching a peak during Week 9 (32.2 per 100,000 beneficiaries). Rates among beneficiaries aged 18 to 44 were slightly higher than other age groups during Week 52, but overall had the lowest rates (Figure 17).

**Figure 17.** Influenza Antiviral Prescriptions Rates (per 100,000) by Age Group, DON Beneficiaries, 2015-2016 Season



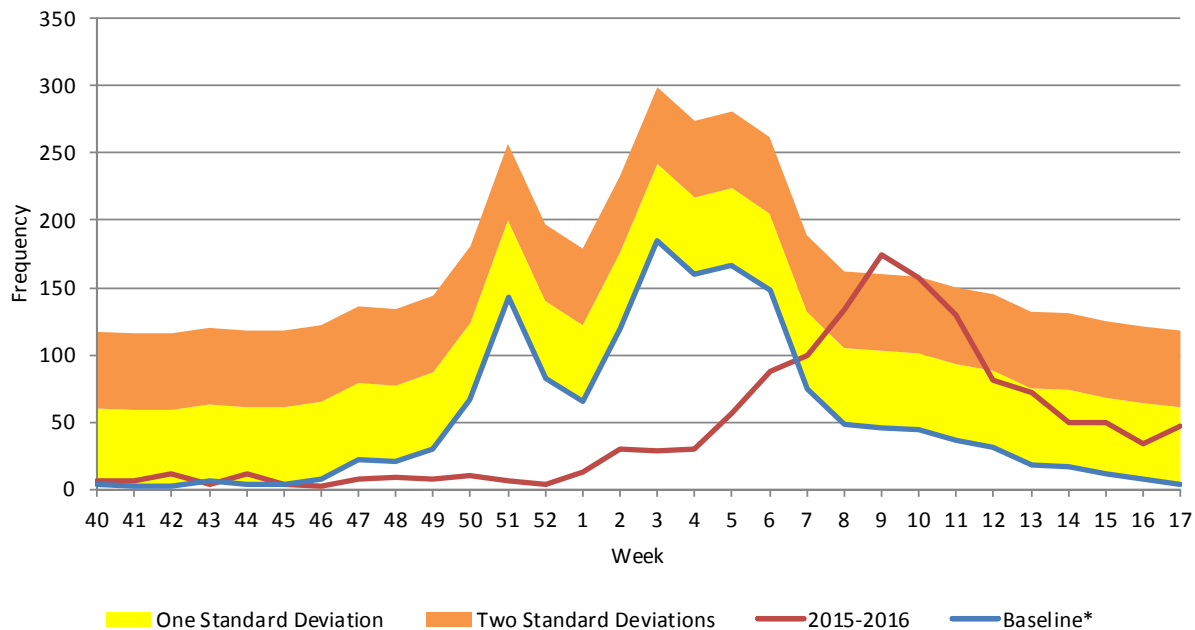
Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



The overall number of AV prescriptions dispensed to children (under the age of 18) was below that observed during the previous season. However, current season frequencies exceeded baseline after Week 6 and reached a peak during Week 9 that was more than two standard deviations above baseline. The peak (n=175) measured approximately three times the seasonal baseline (Figure 18).

**Figure 18.** Frequency of Influenza Antiviral Prescriptions Dispensed to Children in Comparison with Seasonal Baseline, 2015-2016 Season



\*Weighted average of the 2012-2013, 2013-2014, 2014-2015 seasons.

Children include dependents of active duty personnel under the age of 18.

Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## Inpatient Cases with Antiviral Prescriptions

Of the 92 DON cases that were laboratory-positive for influenza in the inpatient setting, 73 (79.3%) had pharmacy records that indicated prescriptions for AV treatment. All inpatient cases were prescribed oseltamivir. A large majority of cases had an AV prescription dispensed on the same day as the laboratory specimen was collected (n=47; 64.4%); the difference between the collection date and pharmacy transaction date ranged from one day before to one day after. Table 7 compares the inpatient cases that received AV medication to those that did not; the largest proportion of those that received an AV prescription were above 45 years of age (61.6%).

**Table 7.** Demographic Characteristics of DON Laboratory-Positive Inpatient Cases by Antiviral Treatment Status, 2015-2016 Season

	Dispensed Antiviral Prescription	No Antiviral Prescription
	n (%)	n (%)
<b>Gender</b>		
Male	40 (54.8)	12 (63.2)
Female	33 (45.2)	7 (36.8)
<b>Age Group</b>		
0-4	7 (9.6)	2 (10.5)
5-17	7 (9.6)	3 (15.8)
18-44	14 (19.2)	3 (15.8)
45+	45 (61.6)	11 (57.9)
<b>Beneficiary Category</b>		
Active Duty	5 (6.9)	1 (5.3)
Recruit	5 (6.9)	1 (5.3)
Spouse	24 (32.9)	3 (15.8)
Child	15 (20.6)	5 (26.3)
Other: Sponsor	24 (32.9)	9 (47.4)
<b>Total</b>	<b>73</b>	<b>19</b>

Data source: HL7-formatted CHCS microbiology, chemistry and pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## Comorbidities Among Inpatient Cases

Among the 3,980 influenza AV prescriptions administered during the 2015-2016 season, 268 occurred in an inpatient setting among 264 individuals. All but one inpatient record had a matching ambulatory record within 14 days of the pharmacy transaction date. The median duration between admission and discharge for inpatient cases was two days, with a maximum duration of 37 days. The twenty most common comorbidities identified from diagnosis codes among cases identified in inpatient records and who received an influenza AV are listed in Table 8. Other than administrative/social admissions (which includes routine examinations, screening) and residual, unclassified codes, influenza was the most common diagnostic category (n=190), followed by other lower respiratory disease (n=123), pneumonia (n=105), and essential hypertension (n=101).

**Table 8.** Twenty Most Common Comorbidities among Inpatient Cases Receiving Influenza Antiviral Prescriptions, 2015-2016 Season (n=264)

Diagnosis Classification	Frequency	Percent
Administrative/social admission	190	72.0%
Influenza	157	59.5%
Residual codes; unclassified	128	48.5%
Other lower respiratory disease	123	46.6%
Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	105	39.8%
Essential hypertension	101	38.3%
Fluid and electrolyte disorders	91	34.5%
Cardiac dysrhythmias	83	31.4%
Other aftercare	80	30.3%
Fever of unknown origin	76	28.8%
Deficiency and other anemia	68	25.8%
Other screening for suspected conditions (not mental disorders or infectious disease)	63	23.9%
Screening and history of mental health and substance abuse codes	63	23.9%
Disorders of lipid metabolism	62	23.5%
Other connective tissue disease	62	23.5%
Other gastrointestinal disorders	62	23.5%
Other upper respiratory infections	62	23.5%
Other nutritional; endocrine; and metabolic disorders	59	22.3%
Diabetes mellitus without complication	54	20.5%
Other nervous system disorders	53	20.1%

Note: Cases may be classified within more than one diagnostic category.

Data sources: Standard Inpatient Data Record (SIDR) and Comprehensive Ambulatory/Professional Encounter Record (CAPER).

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## Rapid Test Results with Antiviral Prescriptions

There were 11,116 unique rapid test laboratory specimens, of which 1,352 (12.2%) had an AV prescribed within 14 days of the specimen collection date. Among the DON beneficiaries dispensed an influenza-specific AV, 62.7% had a positive rapid test (Table 9).

**Table 9.** DON Rapid Influenza Specimen Results by Influenza Antiviral Treatment Status, 2015-2016 Season

Rapid Test Result	Rapid Tests w/Antivirals (%)	Rapid Tests w/o Antivirals (%)
Negative	505 (37.4%)	9,154 (93.8%)
Positive	847 (62.7%)	610 (6.3%)
Total	1,352	9,764

Data sources: HL7-formatted CHCS chemistry, microbiology, and pharmacy data.

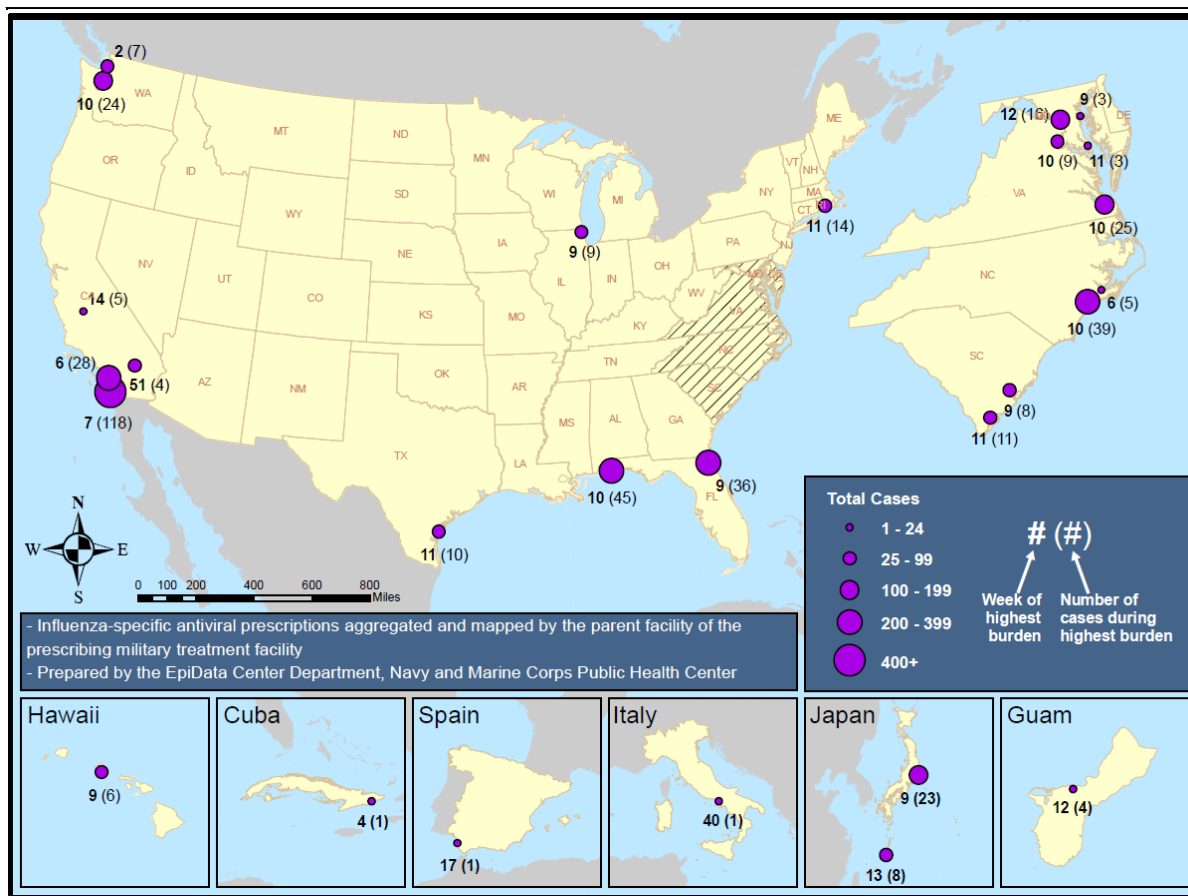
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016



## Geographical Distribution

Navy parent MTFs along the US Pacific Coast experienced earlier peak volumes of dispensed AV prescriptions among DON beneficiaries than mid-Atlantic and southeastern MTFs. Figure 19 displays the week of the highest burden and the corresponding number of AV prescriptions dispensed that week for each MTF. The earliest peak week is displayed on the map; NH Camp Pendleton dispensed 28 AV prescriptions during Week 6 and Week 8; other facilities may have dispensed one AV during multiple weeks.

**Figure 19.** Influenza-Specific Antiviral Prescriptions by Parent Facility and Week of Highest Burden, DON Beneficiaries at DON Facilities and Walter Reed National Military Medical Center, 2015-2016 Season



Data source: HL7-formatted CHCS pharmacy data.

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016

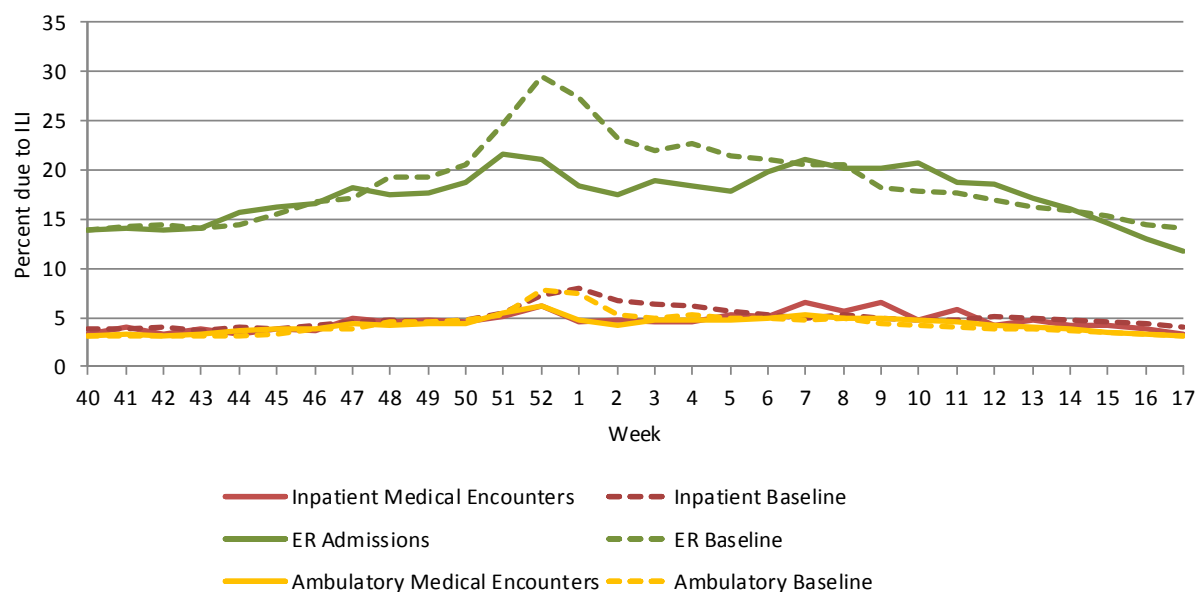


## Encounter ILI Diagnosis Tracking

### Overall

The percentage of medical encounters and ER visits due to ILI among DON beneficiaries followed historical trends, though they exceeded baseline values during several weeks. ER visits due to ILI peaked during Week 51 and Week 7 and remained above baseline through Week 14 (Figure 20). The overall percentage of inpatient and ambulatory medical encounters due to ILI remained far below those of ER visits. Inpatient medical encounters peaked during Week 7 and Week 9 and remained above baseline through Week 11. Ambulatory medical encounters due to ILI peaked during Week 7 and hovered above baseline through Week 14.

**Figure 20.** Medical Encounters and ER Visits due to Influenza-Like Illness (ILI) among DON Beneficiaries, 2015-2016 Season and Baseline Comparison



Ambulatory counts include emergency room and all other outpatient encounters.

Data sources: Comprehensive Ambulatory/Professional Encounter Record (CAPER) and Standard Inpatient Data Record (SIDR)

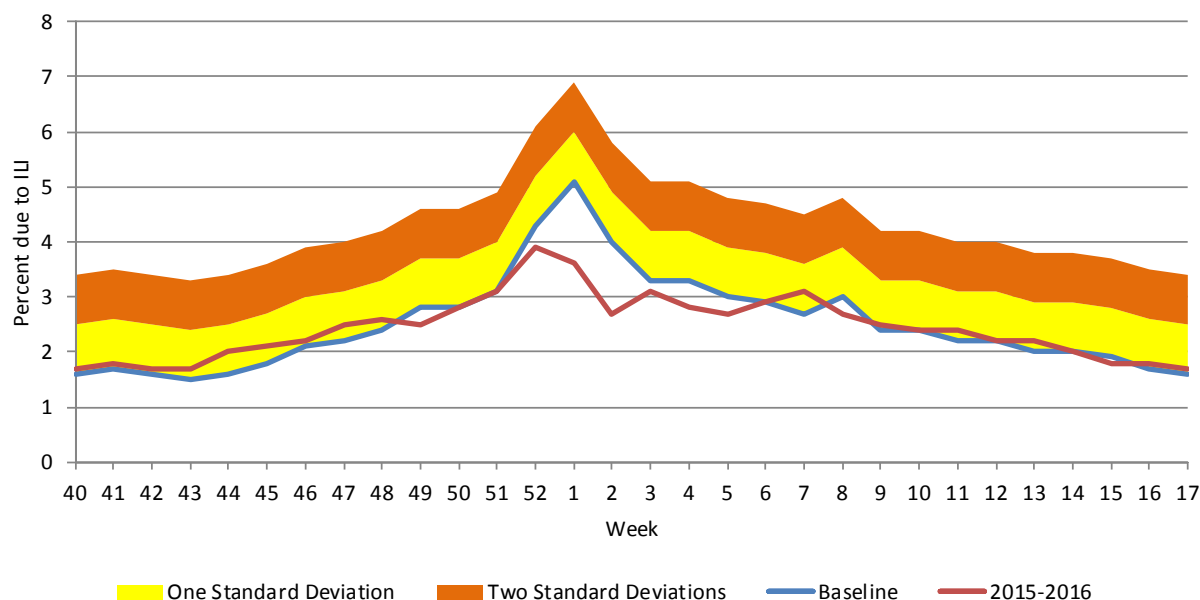
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## Active Duty DON

The percent of ambulatory encounters attributed to ILI among AD DON personnel was below baseline during the peak week, with a high of 3.9% during Week 52 (Figure 21). While these trends mirror those among all DON beneficiaries, the percent of ambulatory encounters due to ILI was lower for AD personnel; on average, 2.4% of encounters included an ILI diagnosis, as compared to 4.3% among all DON beneficiaries (data not shown).

**Figure 21.** Ambulatory Medical Encounters due to Influenza-Like Illness (ILI) among Active Duty DON Personnel, 2015-2016 Season and Baseline Comparison



Data source: Comprehensive Ambulatory/Professional Encounter Record (CAPER).

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## DRSi

During the 2015-2016 influenza season, 42 cases of influenza-associated hospitalizations for DON beneficiaries were reported to DRSi. Laboratory-positive cases and AV prescriptions were matched to DRSi influenza cases. Laboratory cases matched 9 (21.4%) DRSi cases; pharmacy and laboratory cases together matched 24 (57.1%) DRSi cases. Influenza-associated hospitalizations were reported most frequently in Weeks 5 and 12 (six each). NMC San Diego reported the highest number of influenza-associated hospitalizations (n=11).

DON beneficiaries had 57 laboratory-positive inpatient influenza cases under the age of 65 (62.0% of all inpatient laboratory cases); these meet the reportable influenza case definition for DRSi. Twenty (35.1%) of these reportable cases had a record in DRSi.

**Table 10.** Demographic Characteristics of DON Beneficiaries with DRSi Reported Influenza-Associated Hospitalizations, 2015-2016 Season

Gender	Frequency	Percent
Male	29	69.0%
Female	13	31.0%
<b>Age Group</b>		
0-4	6	14.3%
5-17	6	14.3%
18-44	16	38.1%
45+	14	33.3%
<b>Beneficiary Category</b>		
Sponsor	23	54.8%
Spouse	6	14.3%
Child	13	31.0%
<b>Service</b>		
Navy	25	59.5%
Marine Corps	17	40.5%

Data source: Disease Reporting System-internet (DRSi).

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016

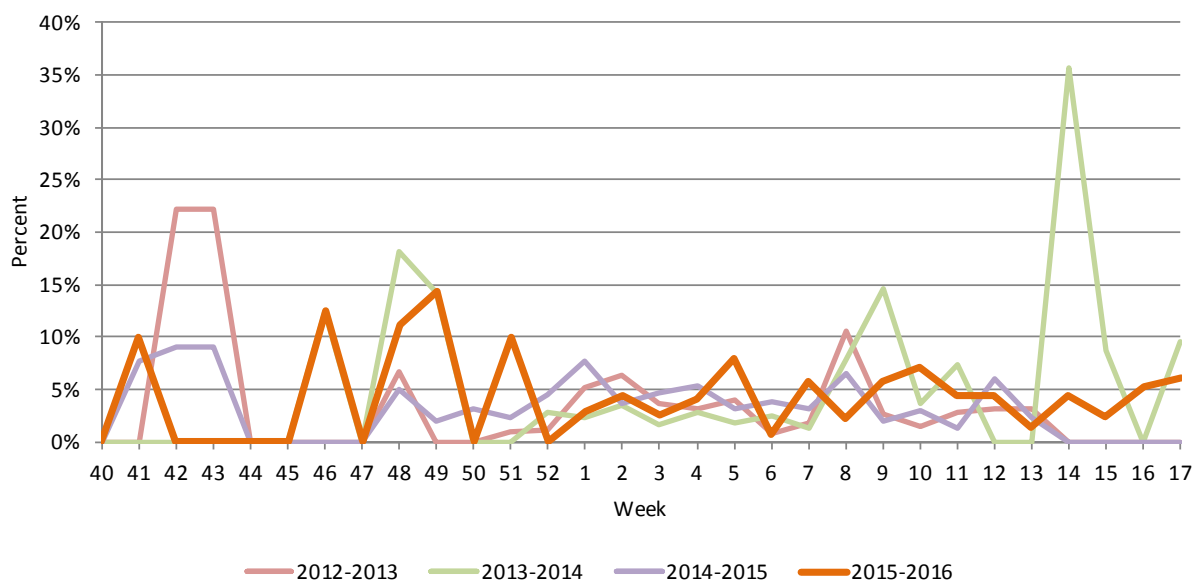


## Coinfections

### Microbiology Isolates

During the 2015-2016 season, 4.5% (n=101) of laboratory-positive influenza cases had a bacterial coinfection, which is slightly higher than the burden of coinfections identified in the 2014-2015 (3.8%) and 2013-2014 (4.2%) seasons. Coinfections include respiratory and non-respiratory infections. As shown in Figure 22, the proportion of coinfections among laboratory positive cases remained under 15% for each week during the 2015-2016 season. Influenza cases peaked around Week 9; however the proportion of coinfections remained low even during the weeks with the highest influenza activity.

**Figure 22.** Percentage of Bacterial Coinfections among Laboratory-Identified Influenza Cases, DON Beneficiaries, 2012-2016 Seasons



Data source: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



The distribution of demographic characteristics varied between respiratory and non-respiratory infections. Table 11 illustrates the demographic characteristics of laboratory-positive influenza cases with and without a bacterial coinfection. The highest proportion of upper respiratory infections occurred among children ages 5-17 with 55.0%, while adults ages 45 and older accounted for over 60% of lower respiratory infections. A greater proportion of individuals with bacterial coinfections were adults aged 45 and older (33.7%) compared to the overall proportion of those aged 45 and older with only an influenza case (22.0%). All upper respiratory infections occurred in an ambulatory setting. Lower respiratory infections were more evenly distributed between inpatient admissions and outpatient encounters. Navy beneficiaries represented a larger frequency of coinfections compared to Marine Corps beneficiaries, which is consistent with the overall distribution of influenza cases by service. Only seven coinfections were among AD and recruit Sailors and Marines.

**Table 11.** Demographics of Laboratory-Identified Influenza Cases by Bacterial Coinfection Status and Specimen Type, DON Beneficiaries, 2015-2016 Season (n=101)

	Influenza Only (%)	Influenza with Bacterial Coinfection			
		Non-Respiratory (%)	Upper Respiratory (%)	Lower Respiratory (%)	Total (%)
Gender					
Male	1,088 (50.3)	13 (27.1)	22 (55.0)	11 (84.6)	46 (45.5)
Female	1,077 (49.7)	35 (72.9)	18 (45.0)	2 (15.4)	55 (54.5)
Age					
0 - 4	363 (16.8)	9 (18.8)	4 (10.0)	1 (7.7)	14 (13.9)
5 - 17	648 (29.9)	4 (8.3)	22 (55.0)	2 (15.4)	28 (27.7)
18 - 44	689 (31.8)	14 (29.2)	9 (22.5)	2 (15.4)	25 (24.8)
45+	465 (21.5)	21 (43.8)	5 (12.5)	8 (61.5)	34 (33.7)
Beneficiary Category					
Active Duty	287 (13.3)	1 (2.1)	3 (7.5)	0 (0)	4 (4.0)
Recruit	68 (3.1)	0 (0)	1 (2.5)	2 (15.4)	3 (3.0)
Spouse	516 (23.8)	24 (50.0)	6 (15.0)	1 (7.7)	31 (30.7)
Child	1,055 (48.7)	14 (29.2)	26 (65.0)	3 (23.1)	43 (42.6)
Other Sponsor	238 (11.0)	9 (18.7)	4 (10.0)	7 (53.8)	20 (19.8)
Other Non-Sponsor	1 (<0.05)	0 (0)	0 (0)	0(0)	0 (0)
Service					
Marine Corps	682 (31.5)	20 (41.7)	14 (35.0)	4 (30.8)	49 (33.3)
Navy	1,483 (68.5)	28 (58.3)	26 (65.0)	9 (69.2)	98 (66.7)
Encounter Type					
Outpatient	2,092 (96.6)	35 (72.9)	40 (100)	6 (46.2)	81 (80.2)
Inpatient	73 (3.4)	11 (22.9)	0 (0)	7 (53.8)	18 (17.8)
Other	0 (0)	2 (4.2)	0 (0)	0 (0)	2 (2.0)
Total	2,165	48	40	13	101

Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



Coinfections represented 12 unique genera of bacterial isolates (Table 12). The most commonly identified genera include *Streptococcus*, *Escherichia*, and *Staphylococcus*; these results are consistent with data from the past three seasons. Upper respiratory infections were most commonly *Streptococcus*, while the most frequent lower respiratory infection was *Staphylococcus*.

**Table 12.** Genera of Coinfections among Laboratory-Identified Influenza Cases, DON Beneficiaries, 2015-2016 Season (n=101)

Coinfection Genus	Specimen Type			Total (%)
	Non-Respiratory (%)	Upper Respiratory (%)	Lower Respiratory (%)	
<i>Streptococcus</i>	8 (16.7)	38 (95.0)	2 (15.4)	48 (47.5)
<i>Escherichia</i>	22 (45.8)	--	1 (7.7)	23 (22.8)
<i>Staphylococcus</i>	10 (20.8)	2 (5.0)	4 (30.8)	16 (15.8)
<i>Klebsiella</i>	2 (4.2)	--	2 (15.4)	4 (4.0)
<i>Proteus</i>	2 (4.2)	--	--	2 (2.0)
<i>Pseudomonas</i>	1 (2.1)	--	1 (7.7)	2 (2.0)
<i>Eikenella</i>	1 (2.1)	--	--	1 (1.0)
<i>Enterococcus</i>	1 (2.1)	--	--	1 (1.0)
<i>Haemophilus</i>	--	--	1 (7.7)	1 (1.0)
<i>Moraxella</i>	--	--	1 (7.7)	1 (1.0)
<i>Mycobacterium</i>	--	--	1 (7.7)	1 (1.0)
<i>Prevotella</i>	1 (2.1)	--	--	1 (1.0)
Total	48	40	13	101

Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

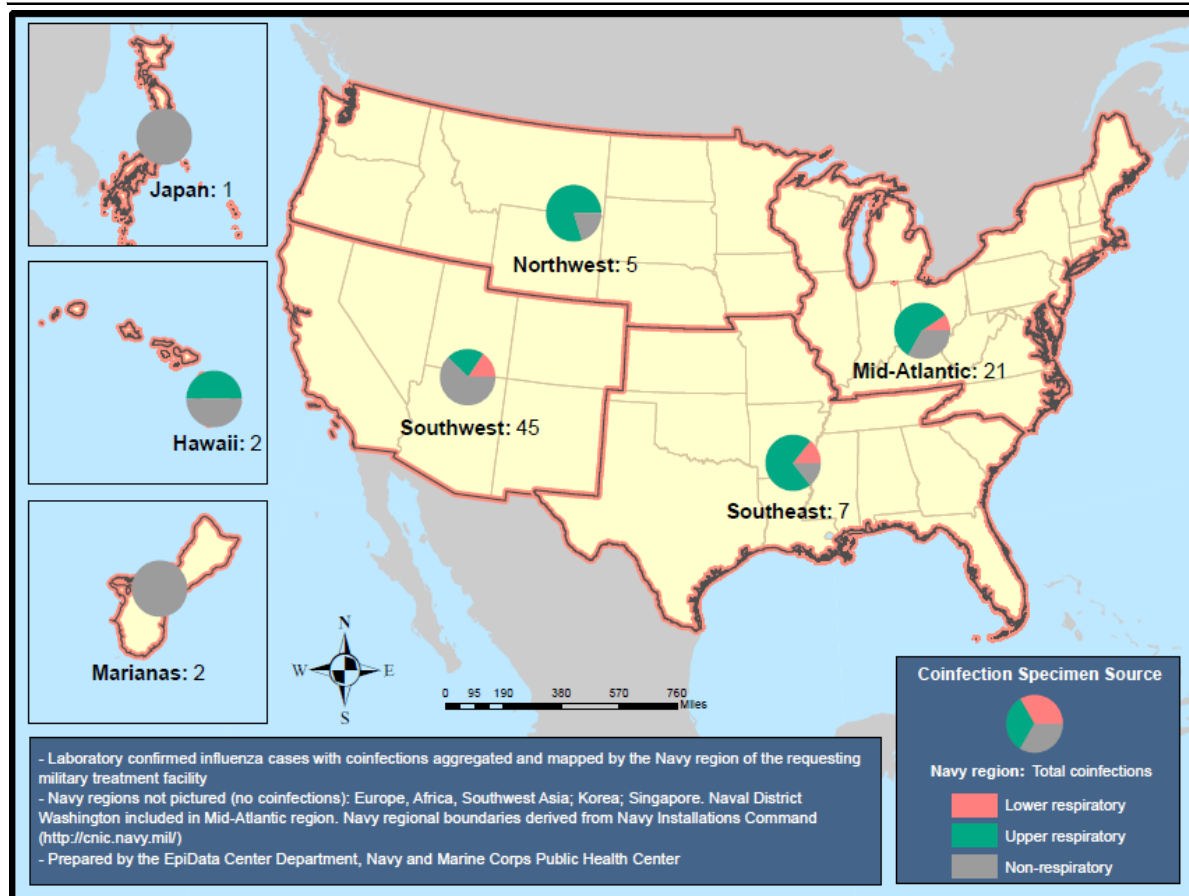




## Geographical Distribution

More than half of the influenza coinfections in all regions, except the Southwest Region, were upper respiratory infections; non-respiratory coinfections were more prominent in the Southwest Region. Five coinfections occurred in OCONUS Regions: Hawaii (n=2), Marianas (n=2), and Japan (n=1).

**Figure 23.** Regional Distribution of Influenza Coinfections by Specimen Source, DON Beneficiaries at DON Facilities and Walter Reed National Military Medical Center, 2015-2016 Season



Data source: HL7-formatted CHCS microbiology data.

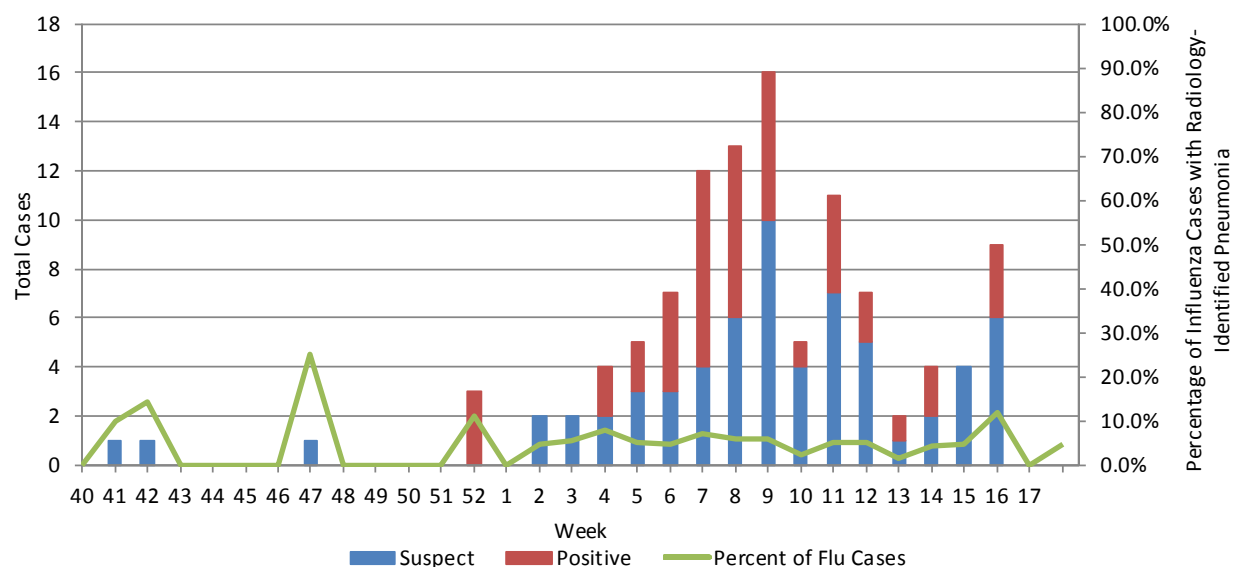
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016

## Radiology-Identified Pneumonia

An analysis of laboratory-positive influenza cases matched to radiology results found 109 cases (4.8%) of positive or suspect radiology-defined pneumonia in 2015-2016, which is a higher percentage than in previous seasons. The percentage of laboratory-positive cases with radiology-defined pneumonia during past seasons was 3.6% for the 2014-2015 season and 2.0% for the 2013-2014 season.

Radiology results were classified as positive or suspect; the percentage of pneumonia cases classified as positive was 41.3%. The volume of pneumonia cases followed the same general trend as laboratory cases, with an increase beginning in Week 4 followed by a peak in Week 9 (Figure 24). However, the weekly percentage of laboratory-positive cases with radiological evidence of pneumonia was relatively consistent; varied between 0.0% and 12.0%, excluding Week 47 (25.0%), when one pneumonia case occurred among just four laboratory cases.

**Figure 24.** Frequency and Percentage of Radiology-Defined Pneumonia among Laboratory-Identified Influenza Cases by Week, DON Beneficiaries, 2015-2016 Season



Data source: HL7-formatted CHCS radiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



Radiology-defined cases primarily were among children (30.3%), followed by spouses (25.7%) and other sponsors (22.9%). The age distribution shows that those 45 years and older represent the largest percentage of radiology-defined cases (40.4%), while children aged 0-4 and 5-17 represent 16.5% and 12.8% of cases, respectively (Table 13). These results are similar to the results for laboratory-identified coinfections (Table 11). One key difference is the percentage of cases among individuals 45 and over, which is higher for radiology-defined pneumonia (40.4%) compared to laboratory-identified coinfections (22.0%). The opposite occurred among those aged 5-17 years, where this age group represented 29.8% of laboratory-identified coinfection cases but only 12.8% of radiology-defined pneumonia cases. These differing age distributions may indicate severity of illness, where influenza cases for older adults appear to be more likely to develop pneumonia than other age groups.

**Table 13.** Demographic Characteristics of Radiology-Defined Pneumonia among Laboratory-Identified Influenza Cases, DON Beneficiaries, 2015-2016 Season (n=109)

	Frequency	Percent
<b>Gender</b>		
Male	67	61.5%
Female	42	38.5%
<b>Age Group</b>		
0 - 4	18	16.5%
5 - 17	14	12.8%
18 - 44	33	30.3%
45+	44	40.4%
<b>Beneficiary Category</b>		
Active Duty	8	7.3%
Recruit	15	13.8%
Spouse	28	25.7%
Child	33	30.3%
Other: Sponsor	25	22.9%
<b>Service</b>		
Marine Corps	48	44.0%
Navy	61	56.0%
<b>Classification</b>		
Positive	45	41.3%
Suspect	64	58.7%
<b>Total</b>	109	--

Data sources: HL7-formatted CHCS radiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## Vaccinations

### Active Duty

The DOD set a goal to reach 90% immunization of all AD service members by 15 December 2015 (Week 50). Navy AD service members reached the goal of 90% vaccination coverage in Week 51 (20-26 December 2015), three weeks earlier than the 2014-2015 season. Marine Corps AD service members reached the goal of 90% vaccination coverage at Week 1 (3-9 January 2016), also three weeks earlier than the 2014-2015 season. Navy reservists reached the goal of 90% vaccination coverage at Week 52 (27 December 2015 to 2 January 2016). Marine Corps reservists reached the goal of 90% vaccination coverage at Week 7 (14-20 February 2016); Marine Corps reservists had not yet reached the 90% vaccination goal by the end of last season (Week 17). According to the MRRS data, the DON did not achieve the DOD's goal of 90% vaccination by 15 December 2015. This finding may be attributable to a lag in reporting. The final immunization coverage for AD and reserve components of the DON for the 2015-2016 influenza season (at Week 17) is presented in Table 14.

**Table 14.** Influenza Vaccination Coverage, DON Active and Reserve Components, 2015-2016 Season

Service/Component	Total Population	Number Vaccinated*	Number Exempt	Percent Vaccinated**
Navy Active Duty	326,507	309,269	4,080	95.9%
Navy Reserve	50,001	48,045	1,073	98.2%
Marine Corps Active Duty	159,082	152,993	1,138	96.9%
Marine Corps Reserve	35,015	31,417	2,103	95.5%
Total	570,605	541,724	8,394	96.4%

\*Includes both injection and intranasal influenza vaccines.

\*\*Percent vaccinated = proportion of service members vaccinated out of total population excluding exemptions.

Immunization status as of 30 April 2016.

Data source: Medical Readiness Reporting System (MRRS).

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



Of the 291 AD service members with a positive laboratory influenza record this season, 233 (80.1%) were vaccinated more than 14 days prior to their infection, meaning that they were assumed to be fully immune to the influenza virus. Forty members had no record of vaccination, and 18 were vaccinated less than 14 days prior to infection, meaning that they were not yet fully immune to influenza at the time of infection. Seventy-one recruits had a positive laboratory influenza, record of which 45 (63.4%) were vaccinated more than 14 days prior to their infection and 26 were vaccinated less than 14 days prior to infection. Table 15 presents the vaccination status of AD and recruit influenza laboratory cases and type of vaccination received.

**Table 15.** Vaccination Status of DON Active Duty and Recruit Influenza Cases, 2015-2016 Season

		Vaccine Type				Total	Percent
Status	Immunity Status	LAIV	IIV	LAIV and II	None		
Active Duty	Vaccinated; immune	78	150	5	-	233	80.1%
	Vaccinated; not immune	7	11	-	-	18	6.2%
	No vaccination record	-	-	-	40	40	13.7%
Total		85	161	5	40	291	-
Recruit	Vaccinated; immune	22	23	-	-	45	63.4%
	Vaccinated; not immune	18	8	-	-	26	36.6%
Total		40	31	-	-	71	-

LAIV=live-attenuated influenza vaccine (intranasal), IIV=inactive influenza vaccine (injection).

Vaccinated, immune: Vaccinated more than 14 days prior to infection.

Vaccinated, not immune: Vaccinated less than 14 days prior to infection, or after infection.

Data source: HL7-formatted CHCS chemistry and microbiology data .

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## MTF Vaccine Distribution

There were a total of 306,777 ambulatory encounters for influenza vaccination at Navy MTFs for all DOD beneficiaries between August 2015 and March 2016. The most frequently administered type of vaccine was inactivated influenza vaccine (IIV, 64.7%), followed by live-attenuated influenza vaccine (LAIV, 35.3%). Most seasonal influenza vaccines administered this season at Navy DON MTFs were live, intranasal, quadrivalent influenza vaccines (35.3%), which are categorized by CPT code 90672 (Table 16).

**Table 16. Influenza Vaccines Administered at Navy MTFs by Type, All DOD Beneficiaries, August 2015 through March 2016**

CPT Code	CVX Code	Vaccine Type	Count	Percent
90655	140	Influenza, seasonal, injectable, preservative free, for persons 6-35 months	1518	0.5%
90656	140	Influenza, seasonal, injectable, preservative free, for persons 3 years and older	28,760	9.4%
90657	141	Influenza, seasonal, injectable, for persons 6-35 months	593	0.2%
90658	141	Influenza, seasonal, injectable, for persons 3 years and older	24,346	7.9%
90672	149	Influenza, live, intranasal, quadrivalent	108,331	35.3%
90685	161	Influenza, injectable, quadrivalent, preservative free, for persons 6-35 months	25,131	8.2%
90686	150	Influenza, injectable, quadrivalent, preservative free, for persons 3 years and older	96,863	31.6%
90688	158	Influenza, injectable, quadrivalent, for persons 3 years and older	21,235	6.9%
Total			306,777	

Data source: Comprehensive Ambulatory/Professional Encounter Record (CAPER).

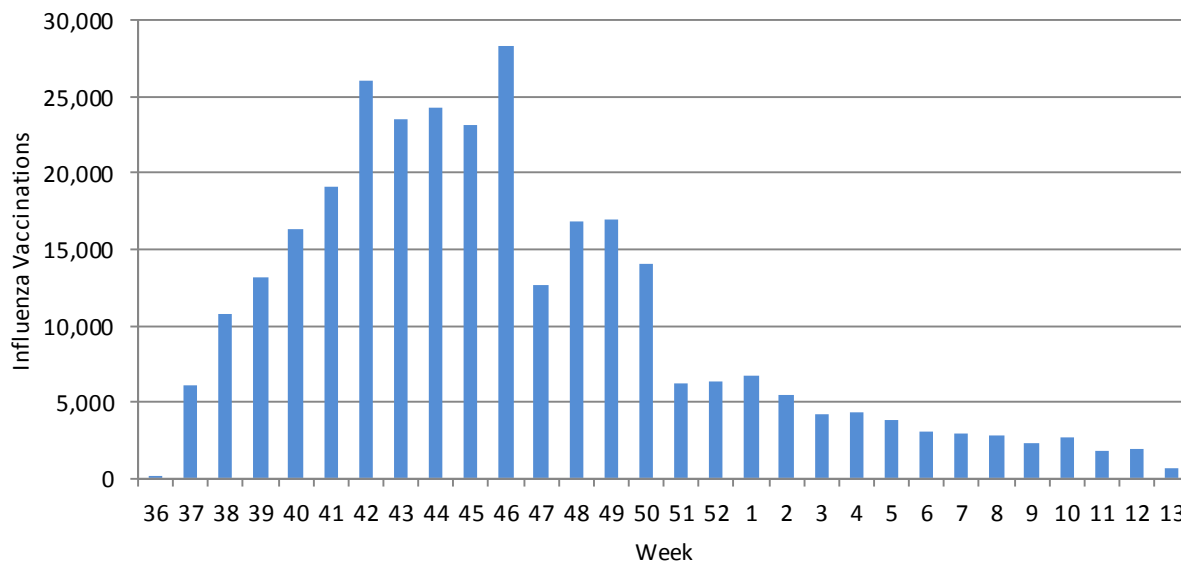
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016





The peak time period of vaccine administration at Navy MTFs occurred between Weeks 42 and 46, when approximately 40.8% of total vaccines were administered to beneficiaries of all services (Figure 25). The Navy MTFs that administered the most influenza vaccines included NMC Portsmouth (18.1%), followed by NMC San Diego (11.2%), NH Pensacola (8.7%), and NH Camp Lejeune (7.0%).

**Figure 25.** Influenza Vaccines Administered During Outpatient Encounters at Navy MTFs, All Beneficiaries, 2015-2016 Season



Data source: Comprehensive Ambulatory/Professional Encounter Record (CAPER).

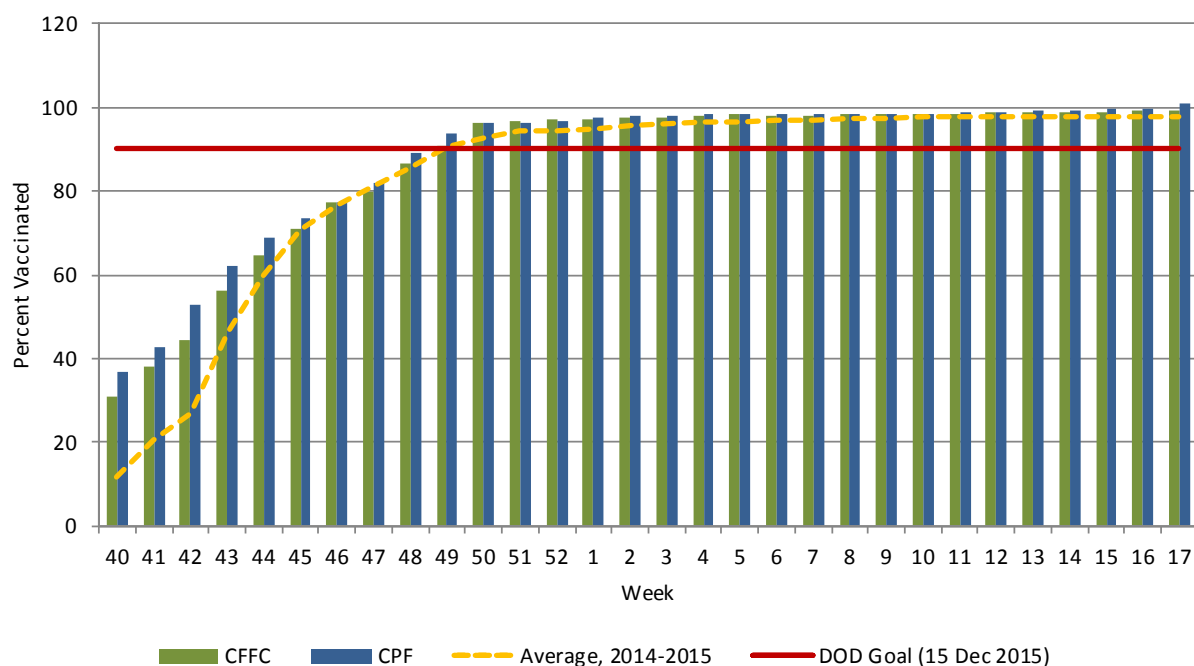
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## US Fleet Forces Command

US Fleet Forces achieved 90% influenza vaccination coverage at Week 49 (December 6, 2015), more than a week before the DOD's goal of 90% vaccination by 15 December 2015. By Week 49, the percentage of eligible AD personnel vaccinated for Central Fleet Forces Command (CFFC) and Pacific Fleet Command (CPF) were 90.7% and 93.9%, respectively. At the end of the season (Week 17), coverage rates were 99.2% for CFFC and 99.9% for CPF (Figure 26). Compared to the average vaccination coverage in the 2014-2015 season, vaccination rates were higher during each week and for the total season; the difference may be attributed to the delay in the availability of vaccines that occurred during last season.

**Figure 26.** Influenza Vaccination Coverage for Central Fleet Forces Command (CFFC) and Pacific Fleet Command (CPF), Seasons 2014-2015 and 2015-2016



Average includes CFFC and CPF data for the previous season.

Data source: Medical Readiness Reporting System (MRRS).

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



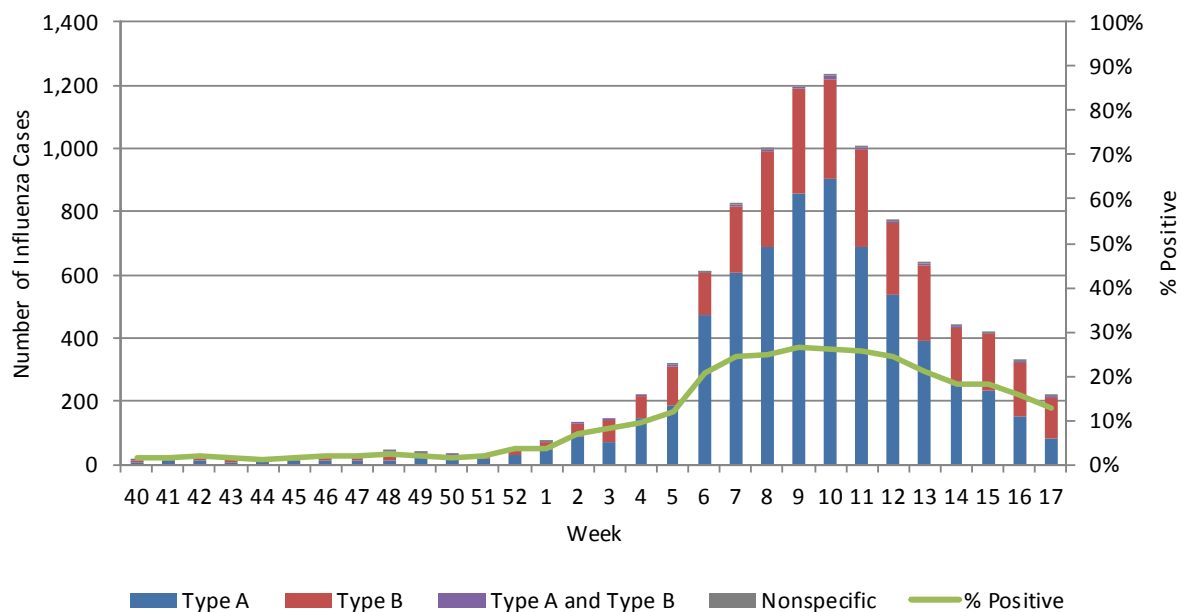
## DOD Results

### Laboratory

The total volume of cases for DOD beneficiaries was 9,939 influenza-positive laboratory specimens for 8,101 DOD beneficiaries during the 2015-2016 season. The most common influenza type among positive laboratory specimens was influenza A (66.3%), followed by influenza B (66.3%), dual infection with A and B (1.2%), and nonspecific types (less than 1%). The majority of positive cases were identified by rapid testing (68.9%), followed by PCR (24.9%), and culture (6.0%).

The number of positive laboratory specimens peaked during Week 10 (n=1,236) (Figure 27). The percent of positive influenza tests increased above 10% in Week 5 and remained above 10% for the rest of the season. Overall, 14.6% of influenza tests were positive.

**Figure 27.** DOD Laboratory-Positive Influenza Tests by Influenza Type, 2015-2016 Season



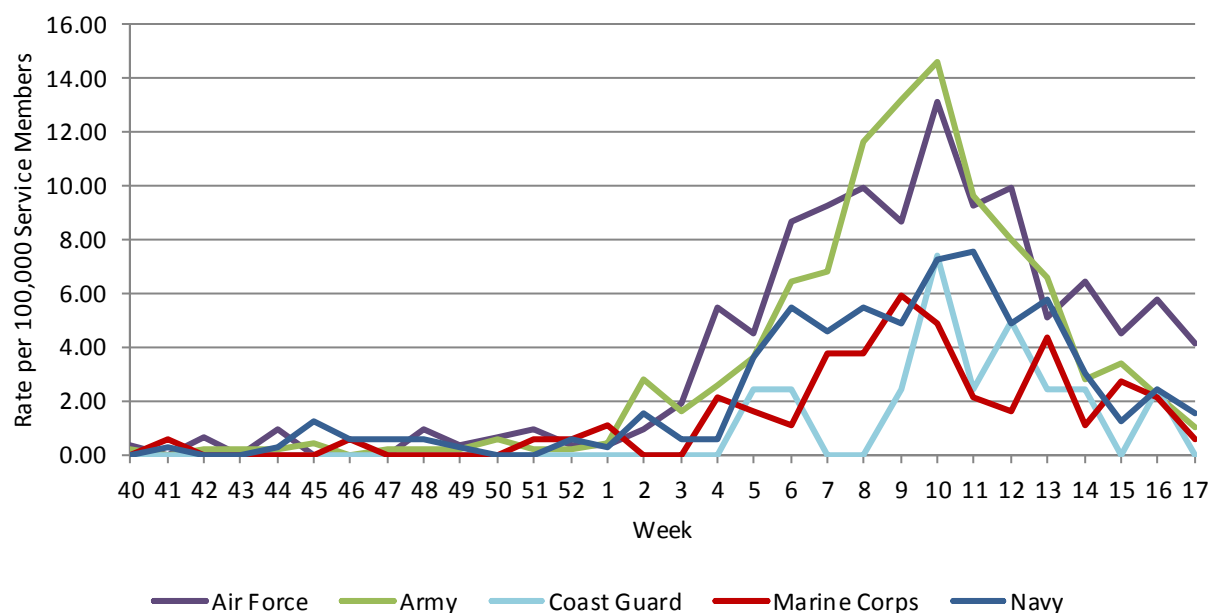
Data sources: HL7-formatted CHCS chemistry and microbiology data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



This season, there were 1,156 AD laboratory-positive influenza cases (500 Army, 353 Air Force, 215 Navy, 76 Marine Corps, and 12 Coast Guard) and 136 recruit laboratory-positive influenza cases (4 Army, 10 Air Force, 21 Navy, 50 Marine Corps,). Recruit status was assigned based on patient category codes within the laboratory records; services may not all use the codes uniformly. Rates of laboratory-positive influenza cases by service per 100,000 AD service members are presented in Figure 28. Rates were generally highest among Army service members throughout the season. Influenza rates for the Army, Coast Guard, and Air Force peaked in Week 9, while the rates for the Navy and Marine Corps peaked in Week 10, similar to the overall DOD population.

**Figure 28.** Rates of Laboratory-Positive Influenza Cases by Service, per 100,000 Active Duty Service Members, 2015-2016 Season



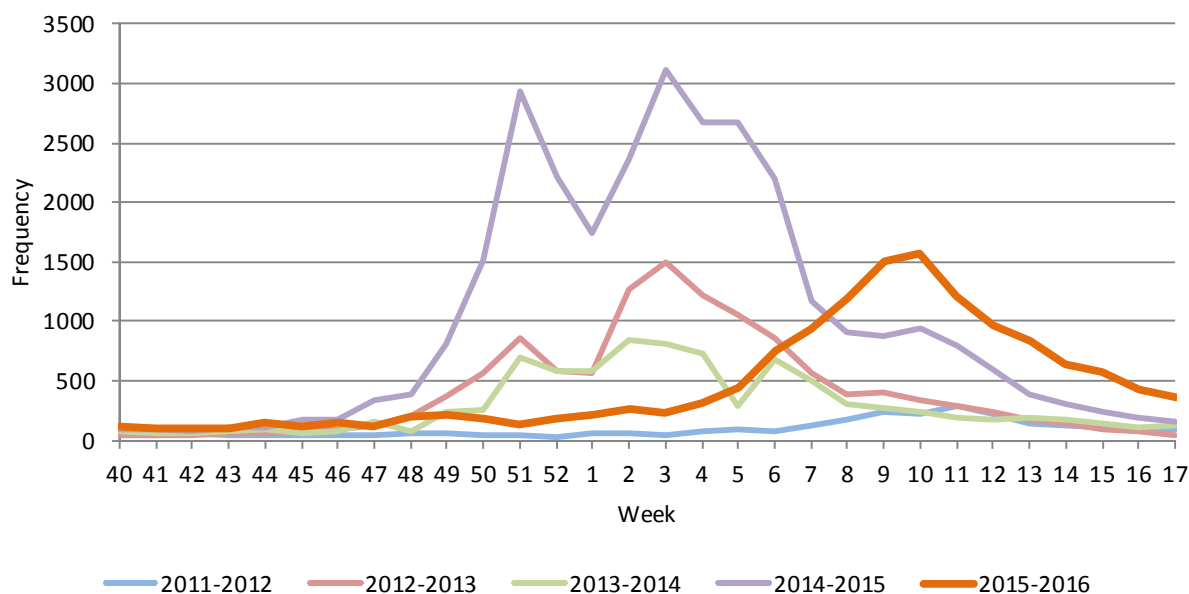
Data source: HL7-formatted CHCS chemistry and microbiology data, Military Health System Management and Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



## Pharmacy

A total of 14,332 influenza AV prescriptions were dispensed to DOD beneficiaries during the 2015-2016 influenza season; less than half the number of prescriptions dispensed during previous seasons. Although total frequencies were lower this season, AV prescriptions rose above previous season at Week 7 and peaked during Week 10, remaining above previous seasons until the end of the surveillance period (Week 17) (Figure 29).

**Figure 29.** Frequency of Influenza Antiviral Prescriptions Dispensed to DOD Beneficiaries, 2011-2016 Seasons



Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.



Approximately five percent (n=766) of AVs were prescribed in the inpatient setting. Among the five drugs of interest, oseltamivir was prescribed most frequently in both the ambulatory and inpatient settings. Two rimantadine and no zanamivir prescriptions were identified in the ambulatory setting (Table 17).

**Table 17.** Influenza Antiviral Prescriptions Dispensed to DOD Beneficiaries by Military Treatment Facility Setting, 2015-2016 Season (n=14,332)

Antiviral	Ambulatory (%)	Inpatient (%)	Total (%)
Amantadine	96 (0.7)	85 (11.1)	181 (1.3)
Oseltamivir	13,468 (99.3)	681 (88.9)	14,149 (98.7)
Zanamivir	2 (< 0.1)	0 (0.0)	2 (< 0.1)
Total	13,566	766	14,332

Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.

Among beneficiary groups, children represented the largest majority of dispensed AVs (37.6%), followed by spouses (26.5%), AD personnel (19.0%), and recruits (0.9%) (Table 18).

**Table 18.** Influenza Antiviral Prescriptions Dispensed to DOD Beneficiaries by Demographics, 2015-2016 Season

	Frequency	Percent
<b>Gender</b>		
Male	7,186	50.1%
Female	7,146	49.9%
<b>Age Group</b>		
0 - 4	2,038	14.2%
5 - 17	3,028	21.1%
18 - 44	5,357	37.4%
45+	3,909	27.3%
<b>Beneficiary Category</b>		
Active Duty	2,720	19.0%
Recruit	125	0.9%
Spouse	3,800	26.5%
Child	5,387	37.6%
Other: Sponsor	2,263	15.8%
Other: Non-Sponsor	37	0.3%
Total	14,332	100.0%

Data source: HL7-formatted CHCS pharmacy data.

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016.





## Discussion

During the 2015-2016 season, influenza activity among DON beneficiaries within the MHS began and remained above baseline later in the season in comparison to previous seasons. Among DON beneficiaries, the total number of laboratory-positive cases and influenza-specific AVs were both below historical baselines, indicating less influenza activity during the current season compared to other seasons. Trends in laboratory and pharmacy surveillance were comparable; both were below historical baseline until Week 5 and Week 7, respectively, and increased to a peak greater than two standard deviations above baseline during Week 9 and Week 10 before displaying a downward trend that remained above baseline until the end of the surveillance period (Week 17). Influenza activity for AD personnel was similar to overall trends; the burden of influenza was lower than the 2014-2015 season but higher than the 2012-2013 and 2013-2014 seasons.

Influenza activity in the DON followed similar trends to those reported by the CDC, where infections in the US were lower and peaked later than in the previous three seasons. A peak was observed during Week 10 when approximately 24% of influenza specimens from collaborating laboratories within the WHO and National Respiratory and Enteric Virus Surveillance System were positive.<sup>12</sup> Laboratory positivity among DON beneficiaries reached a high point just one week earlier, during Week 9. Nationally, persons aged 5 to 24 years were reported to have the highest rates of laboratory-positive influenza. Among DON beneficiaries, children under the age of five had the highest rates of laboratory-positive influenza, followed by children 5-17 years of age.

According to the CDC surveillance data, influenza A (H1N1) was predominant during the 2015-2016 season; however there were periods of increased activity of other influenza types. H3N2 predominated from October through December and influenza B viruses predominated from mid-April through mid-May.<sup>12</sup> Although the EDC laboratory surveillance processes do not allow for complete subtyping results, the findings support this evidence, where nearly 63% of MHS laboratory-positive test results were attributable to influenza A. The proportion of influenza B positive specimens fluctuated during the season.

The CDC HAN alert released during Week 5 emphasized the value of initiating influenza-specific AV treatment as soon as possible for symptomatic patients, without waiting for laboratory confirmation.<sup>9</sup> Anecdotally, providers have indicated that once seasonal influenza is endemic in a provider's locality and there is an increase in the volumes of patients with the same symptoms, they perform less testing and begin treating patients empirically. The CDC HAN alert did not appear to discourage DON providers from testing patients for influenza as DON trends for laboratory testing and AV distribution both continued to follow the same trend after the alert. However, the HAN alert focused on the importance of initiating treatment for high-risk or very ill symptomatic patients, without delay for laboratory confirmation.



The EDC utilizes several surveillance measures to assess influenza severity, including laboratory-positive results and pharmacy transactions within an inpatient setting, bacterial coinfections identified among laboratory-positive influenza cases, and the frequency of influenza-associated hospitalizations. The volume of inpatient laboratory-positive specimens and pharmacy transactions was lower compared to previous seasons; however, the proportion of all cases that were inpatient was higher (4.1%) than the previous season (3.1%). The burden of bacterial coinfections among laboratory-positive cases was slightly higher than the previous season, but overall burden was not substantial. However, even during the weeks of the highest influenza activity, the proportion of coinfections among laboratory-positive cases remained below 15%.

Inpatient co-morbidities were similar among laboratory-positive and AV cases; other lower respiratory diseases, essential hypertension, and pneumonia were common co-morbidities among both groups. Adults over the age of 45 comprised the largest proportion of cases in these categories. ILI cases from medical encounters, inpatient admissions, and ER visits among DON beneficiaries followed historical trends. Two peaks were observed; the first occurred around Week 51 and the second occurred around Week 7. The percentage of ambulatory encounters among AD DON personnel was lower than among DON beneficiaries, although ILI trends were similar among the two groups. Nearly 5% of laboratory-positive cases were identified with positive or suspect radiology-defined pneumonia, a higher percentage than in previous seasons.

The Navy Bureau of Medicine and Surgery (BUMED) plays a crucial role in the implementation of the influenza immunization policy; this season's goal of 90% vaccination coverage of DON AD personnel was obtained shortly after the DOD deadline of 15 December 2015. Despite successful vaccination program efforts, influenza specimens were still identified in AD and recruit personnel who obtained full immunization coverage before a positive specimen collection date. Over 80% of AD Sailors and Marines with a laboratory-confirmed influenza case were vaccinated more than 14 days prior to infection; this may point to a failure of the vaccine to protect against the type of influenza infection for these cases. The CDC's estimate for vaccine effectiveness indicated a 47% reduction in the risk of developing influenza illness with vaccination for the current season.<sup>11</sup>

Robust influenza surveillance in the DON was achieved through the use of multiple data sources. Multiple data sources increased the validity of the findings and provided a comprehensive overview of influenza trends among DON beneficiaries. This information may assist BUMED in determining the overall burden of influenza in the DON community and its impact on mission readiness, and may assist in policy planning and preparation for the upcoming seasons.



## Strengths

The weekly DON SITREP evolves each season based on feedback from the preventive medicine community and leadership, past and anticipated influenza trends, and the availability of new data capabilities. Within the EDC, HL7 formatted laboratory and pharmacy surveillance continue to serve as the primary standard for measuring influenza activity among military beneficiary populations. Weekly baselines are presented with each of our surveillance measures to provide perspective on current influenza activity in relation to more recent seasons, but the EDC maintains the capability to review long-standing historical influenza trends. Laboratory surveillance for influenza is available since the 2005-2006 influenza season, while historical trends for influenza-specific antivirals are available as early as the 2006-2007 influenza season.

The influenza surveillance capabilities established by the EDC provide an unparalleled comprehensive perspective that other national surveillance processes do not, particularly for laboratory and pharmacy data sources. Unlike CDC laboratory influenza surveillance, which relies on sentinel sites, EDC surveillance encompasses a full spectrum of beneficiaries accessing care through military treatment facilities. The ability to use a broad perspective and understand the value of each data source's contribution are essential factors for a comprehensive surveillance system. Additionally, national surveillance systems do not provide monitoring for influenza-specific antivirals, which provide a mechanism to detect influenza-like activity regardless of whether the underlying disease is laboratory-confirmed. This is particularly important where influenza testing may not be routine.<sup>23</sup>

Furthermore, the EDC utilizes HL7 laboratory and pharmacy surveillance to account for under-reporting of hospitalized influenza infections. Reporting severe influenza cases is important as these events have the potential to greatly impact mission readiness, particularly those occurring in AD service members. Timely reporting allows for proper identification, treatment, control, and follow-up of cases, enhancing preventive medicine leaders' ability to respond with control and prevention measures. The EDC assists MTFs with case reporting by feeding laboratory positive reportable influenza cases to the case finding module in DRSi. Data fed to the case finding module can be used to pre-fill a MER, reducing the amount of time required for MER completion and lowering the risk for data entry errors. Case reporting guidelines and requirements should be reemphasized prior to the start of the season and emphasized throughout the season.

The EDC provides weekly surveillance processes outside of the DON SITREP to provide supportive expertise to BUMED and the Armed Forces Health Surveillance Branch (AFHSB). To support influenza surveillance across the DOD, the EDC provides weekly extracts of HL7 formatted laboratory records, including classified test results and sub-types where applicable. These extracts are utilized to create the weekly DOD Seasonal Influenza Surveillance Summary, published by AFHSB. In addition, the EDC calculates overall percent positive and inpatient percent positive of influenza laboratory tests and percent of AV prescriptions dispensed in the inpatient setting by parent MTF. These values are supplied to BUMED on a weekly basis during the influenza season to contribute to an online dashboard used to provide situational awareness of disease burden impact on facilities, measure readiness, and facilitate organizational planning.



## Limitations

Several noteworthy limitations are applicable to this analysis. Medical data considered in this report were generated within CHCS at fixed-MTFs. This analysis does not include records from purchased care providers, shipboard facilities, battalion aid stations, or in-theater facilities.

The microbiology database primarily consists of results for culture testing. Microbiology testing results only show the organism(s) that were identified, not what the test was intended for (e.g., if a physician suspects an organism different from the one that was identified, the record will not show the organism that the physician suspected). Microbiology data are useful for identifying laboratory positive cases of illness. However, cases where a physician chooses to treat presumptively without laboratory confirmation will not be captured. Clinical practice with regards to culturing varies between providers and facilities. Examples of situations where cultures may not be performed include confirmatory tests for patients with ILI symptoms, or patients with superficial infections who are treated presumptively. Classifying microbiology tests involves extensive searching of free-text test result fields.

The chemistry database consists of non-culture laboratory test results (e.g., PCR and antigen testing). Providers may order a group of tests, called panels, when patients present with non-specific symptoms. If the test name or test results within a panel are not disease-specific, these results may not be captured in search terms used to query the chemistry data. Classifying chemistry tests involves extensive searching of free-text test result fields. It is possible that some test results could be misclassified, though validation steps were included to reduce error.

The radiology database consists of results for radiographic testing. Providers order radiology tests based on patient symptoms and their clinical impressions. Results included in the radiology records describe radiologist findings and impressions of the test. In general, a summary of the test results is available at the end of the test result text, but misclassification of the outcome is still possible as this is a free-text field. Though case status can be classified based on radiology records, final diagnosis of a patient is done by a physician after considering a patient's clinical history, current symptoms, and available laboratory test results. When radiology test results are updated, only the most recent record is considered for analysis. During ongoing surveillance efforts, case status may change as record updates become available.

The pharmacy databases consist of ambulatory non-intravenous prescriptions (ambulatory), inpatient non-intravenous prescriptions (unit-dose), and intravenous prescriptions (intravenous). Though treatment compliance in the inpatient setting can be assumed, ambulatory pharmacy records indicate that a patient received a prescription and subsequent compliance is unknown. Due to near real-time data feeds, analysts are able to determine if a prescription was edited or canceled; however, the time difference between these events may allow for a short period of treatment not considered in this analysis. During ongoing surveillance efforts, patient treatment status may change as edited or canceled prescription records are received.





Data for medical surveillance are considered provisional and medical case counts may change if the discharge record is edited after the patient is discharged from the MTF, and case counts may change between the time the report is created and distributed. Records of medical encounters depend on correct ICD-9-CM and ICD-10-CM coding practices. Additionally, because records are submitted into the system at different times, there may be patients who have had an inpatient or ambulatory encounter but were not captured in the current data. Inpatient records are created at discharge or transfer from an inpatient medical treatment facility. For AD personnel only, non-MTF (purchased care) hospitalizations generate a record upon discharge.

The EDC weekly extract of ITS data are limited to AD DON and reserve service members and includes vaccinations recorded within the MHS and SNAP Automated Medical System (SAMS) for shipboard and Marine Corps personnel. SAMS updates to ITS may be delayed due to internet and server connection requirements. Family member vaccination status cannot be assessed in ITS. Reserve service members' routine vaccinations may not be captured in ITS data if reservists do not routinely seek care/vaccinations within the MHS. Furthermore, exemption or waiver records for members are only generated once at the time they are granted. Any extended exemption provided prior to EDC extract initiation (2007) will not be present in the EDC ITS data.

DRSi is a passive medical event reporting system dependent upon DRSi recorders to document reportable events into the system on a case-by-case basis; therefore, underreporting is likely for most routine medical events. MER completeness and validity is reliant upon accurate data entry by DRSi recorders, usually preventive medicine technicians (PMTs), tasked with completing MERs at the local command level. Internet access is required to submit a MER, so the time from the event to entry into DRSi may be delayed, especially events discovered at sea or when deployed. Reportable medical events identified outside of the MHS, such as purchased care visits, cannot be recorded in DRSi unless the case is reported to a local MTF.

MRRS is a web-based application that tracks a variety of individual medical readiness indicators, including immunizations for the Coast Guard, Navy and Marine Corps. MRRS access requires an account to enter information or view reports. Information for active duty and reserve service members is entered by authorized users but delay of record entry may be due to connectivity from fleet units and medical support. MRRS data come from multiple sources, including the Defense Manpower Data Center. Data gaps in the sources that feed the MRRS may impact the completeness and timeliness of the system.



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## Appendix A: ILI Diagnosis Codes

ICD-9 CM Codes for Influenza-Like Illness (ILI) Diagnoses 2015-2016	
Code	Description
079.99	unspecified viral infections
382.9	otitis media unspecified
460	acute nasopharyngitis (common cold)
461.9	acute sinusitis unspecified
464	acute laryngitis and tracheitis
464.1	acute tracheitis
464.10	acute tracheitis without mention of obstruction
464.11	acute tracheitis with obstruction
464.2	acute laryngotracheitis
464.20	acute laryngotracheitis without mention of obstruction
464.21	acute laryngotracheitis with obstruction
465.9	acute upper respiratory infection, unspecified site
466	acute bronchitis and bronchiolitis
466.0	acute bronchitis
480.9	viral pneumonia, unspecified
485	bronchopneumonia, organism unspecified
486	pneumonia, organism unspecified
487	influenza
488	influenza due to certain identified virus
490	bronchitis, not specified as acute or chronic
490.0	bronchitis, not specified as acute or chronic
780.6	fever
780.60	fever, unspecified
786.2	cough
Datasource: ESSENCE ILI Syndrome Definition	
Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016	



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 EpiData Center Department

ICD-10 CM Codes for Influenza-Like Illness (ILI) Diagnoses 2015-2016	
Code	Description
H66.91	otitis media, unspecified, right ear
H66.92	otitis media, unspecified, left ear
H66.93	otitis media, unspecified, bilateral
J00	acute nasopharyngitis [common cold]
J01.8	other acute sinusitis
J01.9	acute sinusitis, unspecified
J01.90	acute sinusitis, unspecified
J02.9	acute pharyngitis, unspecified
J04.1	acute tracheitis
J04.10	acute tracheitis without obstruction
J04.2	acute laryngotracheitis
J06	acute upper respiratory infection of multiple and unspecified sites
J06.0	acute laryngopharyngitis
J06.9	acute upper respiratory infection, unspecified
J09	influenza due to certain identified influenza viruses
J09.X	influenza due to identified novel influenza A virus
J09.X1	influenza due to identified novel influenza A virus with pneumonia
J09.X2	influenza due to identified novel influenza A virus with other respiratory manifestations
J09.X9	influenza due to identified novel influenza A virus with other manifestations
J10	influenza due to other identified influenza virus
J10.0	influenza due to other identified influenza virus with unspecified type of pneumonia
J10.00	influenza due to other identified influenza virus with unspecified type of pneumonia
J10.01	influenza due to other identified influenza virus with the same other identified influenza virus pneumonia
J10.08	influenza due to other identified influenza virus with other specified pneumonia
J10.1	influenza due to other identified influenza virus with other respiratory manifestations
J10.8	influenza due to other identified influenza virus with other manifestations
J10.83	influenza due to other identified influenza virus with otitis media
J10.89	influenza due to other identified influenza virus with other manifestations
J11	influenza due to unidentified influenza virus
J11.0	influenza due to unidentified influenza virus with pneumonia
J11.00	influenza due to unidentified influenza virus with unspecified type of pneumonia
J11.08	influenza due to unidentified influenza virus with specified pneumonia
J11.1	influenza due to unidentified influenza virus with other respiratory manifestations
J11.8	influenza due to unidentified influenza virus with other manifestations
J11.83	influenza due to unidentified influenza virus with otitis media
J11.89	influenza due to unidentified influenza virus with other manifestations
J12	viral pneumonia, not elsewhere classified
J12.8	other viral pneumonia
J12.89	other viral pneumonia
J12.9	viral pneumonia unspecified
J18	pneumonia, unspecified organism
J18.1	lobar pneumonia, unspecified organism
J18.8	other pneumonia, unspecified organism
J18.9	pneumonia, unspecified organism
J20.9	acute bronchitis, unspecified
J21.9	acute bronchiolitis, unspecified
J22	unspecified acute lower respiratory infection
J40	bronchitis, not specified as acute or chronic
R05	cough
R50.9	fever, unspecified

Datasource: ESSENCE ILI Syndrome Definition

Prepared by EpiData Center Department, Navy and Marine Corps Public Health Center, July 2016

